THE

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EXHIBITIONS AND TRADE EXPANSION.

WE have always maintained that large international exhibitions formed a most valuable medium for the extension of trade abroad by giving manufacturers an opportunity for introducing their goods to foreign buyers, but we have fully realised that the non-existence, until the last two or three years, of any organisation established specifically for the purpose of arranging British exhibits and for obtaining the best available spaces, often made it difficult for firms to take part in such exhibitions, and, in any case, detracted from their ultimate value.

It had previously been the custom, when any large exhibition was proposed abroad, for the Government to consider whether or not it would participate officially. If it were finally decided to participate, a Royal Commission was appointed to arrange the British section, but by the time the Commission had been actually appointed and had got to work, all the best spaces had usually been taken up by other countries. Moreover, the absence of any permanent policy with regard to exhibitions, and the lack of experience of previous exhibitions on the part of each new Commission, prevented the best possible results being secured to each individual exhibitor in the British section.

We consequently welcomed with considerable pleasure the appointment of a Royal Commission to inquire as to the nature and extent of the benefit accruing to British industries from the participation of this country in great international exhibitions. This Commission ultimately decided that it was essential that an efficient permanent organisation should be created to act on behalf of British exhibitors in all negotiations with foreign exhibition committees, Customs officials, &c., and to render them such assistance as would enable them to show their goods effectively at International Exhibitions without a prohibitive amount of trouble and expense. Such work could only be properly performed by a Government Department, and it is one more proof of the Board of Trade's recent practical interest in the extension of the trade of this country that it should so readily have formed a separate branch, under the direction of Mr. U. F. Wintour, to carry out the recommendations of the Commission. That this Department has fully justified its formation, even in so short a time, is proved by a report we have now before us which deals with the work of the Exhibitions Branch in connection with the Exhibitions at Brussels, Rome and Turin.

As a result of previous experience at exhibitions, British manufacturers had become rather apathetic regarding new departures of this kind, but there is undoubted evidence that this apathy is being gradually overcome. In the report which is before us the Exhibitions Branch endeavours to trace the commercial results which have accrued to British exhibitors from participation in the Brussels and Turin Exhibitions (the exhibition at Rome was an Art Exhibition and therefore is not of commercial interest). With the object of ascertaining these results, the following questions

were submitted to all British exhibitors at Brussels and Turin :—

1. Have you had, up to the present time, any development in your business which you can directly or indirectly attribute to the Exhibition at Brussels (Turin)?
2. If so, can you give any information as to the extent or value of such development?
3. Have the sales effected, as a result of the exhibition of your goods at Brussels (Turin), repaid you for the cost of exhibiting?
4. Have you any observations to make with regard to any improvement which might be made in the organisation of British exhibits at future exhibitions?

The tracing of "results" of any scheme of advertising is by no means an easy matter, and participation in an International Exhibition, like other forms of advertising, may lead to results which it is very difficult, if not impossible, to trace. It should be borne in mind, however, that abstention from exhibiting when one's competitors are showing their goods may easily lead to a falling-off in sales, so that even if no new business accrues exhibiting will often have had results. Experience has shown that even in the cases of firms with an established reputation and world-wide connections attempts to discontinue advertising have usually been followed by a diminution in the sales effected, and it has been one of the chief causes of Government action as regards foreign exhibitions that the neglect of one of the important forms of national advertisement would be equally detrimental to our interests as a manufacturing country.

The individual answers received to the above questions were, for the most part, of a satisfactory character. In the case of the Brussels Exhibition, 32 per cent. of the exhibitors stated that their exhibits had produced good tangible results. A further 33 per cent. of the exhibitors indicate that they are satisfied with the result of their exhibits, making a total of 65 per cent. who feel that their expenditure in this form of advertising has not been misplaced. Of the remaining 35 per cent., the great majority simply answered the questions in the negative. Of all the answers received relating to the Brussels Exhibition only 11 expressed dissatisfaction, and four of these were from firms who had sustained heavy losses in the fire which destroyed the greater part of the British Section. As regards the Turin Exhibition, the results reported up to the present are not so good as in the case of Brussels, but the time which has elapsed since this Exhibition is hardly sufficient to allow of any accurate estimate of the commercial results which are likely to accrue. The Turin Exhibition, as a whole, also suffered from adverse circumstances, and it is consequently satisfactory to find that 24 per cent. of the exhibitors reported definite tangible results, while a further 30 per cent. reported themselves as satisfied, making 54 per cent. in all. Replies to Question 4 show a distinct desire on the part of exhibitors to co-operate with the Board of Trade in increasing the efficiency of our exhibition work, and the majority of the exhibitors from whom replies have been received have expressed appreciation of the manner in which the organisation of the British sections was carried out and of the services performed on their behalf.

Taking the statistical showing at its face value, results may therefore be taken to be eminently satisfactory, particularly so having in view the short time during which the Exhibitions Branch has been at work. Moreover, we are disposed to think that the Exhibitions Branch is too modest in the conclusions it draws from these statistics. Our experience goes to show that the British commercial community is not too prodigal of its praise, particularly where any Government institution is concerned, and is all too ready to complain on the slightest provocation. We therefore think that the work of the Board of Trade in connection with these Exhibitions is even more fruitful of results than the reports from exhibitors would lead one to believe. We trust that the wish is not father to the thought.

If we might offer criticism at such an early stage in the Board of Trade's active work in exhibitions, it would be that initiative might be displayed in organising independent exhibitions, as well as in participating in foreign exhibitions of the type of those at Turin and Brussels. Taking these two exhibitions as fairly representative, our criticism is that there are other countries than Italy and Belgium whose trade is much more important to us, and where an exhibition of British goods would have much greater results in actual sales; there is a very urgent need for manufacturers to introduce their goods on these markets by ocular display, and permanent, or even temporary, exhibitions organised by the Board of Trade would, we think, meet with support that has not been forthcoming when such exhibitions have been privately arranged or mooted. In South and Central America, in Egypt, in Russia, in our own self-governing Dominions, to name only a few of the countries where our trade might be greatly increased, such exhibitions intelligently organised would, we are sure, have incalculable results. We offer the suggestion for what it is worth; if it has already been considered we commend it for further consideration, confident that if carried out its effect on our trade would be tremendous. Meantime we appreciate the work already being done, and urge manufacturers to co-operate. They may not find everything as they wish, we have heard that they have not, but obviously the Exhibitions Branch is prepared to consider their suggestions for improvement, and is certainly already supplying a want that has been badly felt for many years.

While dealing with this question of exhibitions and trade extension, we may refer to another scheme of exhibition work recently developed by the Board of Trade in collecting samples of foreign goods selling in markets abroad, and placing them before British manufacturers of similar lines of goods. This work, which has up to the present been done by the Commercial Intelligence Branch, is extremely valuable, and is capable of much greater development. Perhaps it is not too much to hope that before long we shall have under Government control a thoroughly organised and efficient scheme of sample bureaux, both abroad for the display of British goods, and at home for the display of the most successful foreign goods which compete with our own on markets abroad. One actual sample is worth reams of description, and it seems to us that along this line the Board of Trade may safely hope to give even more active support to British trade than is already forthcoming. We are, of course, aware that any comprehensive scheme of this kind must entail considerable cost, but we maintain that this increase in expenditure will be fully justified by a large increase of trade, and a consequent improvement in the general prosperity of the country as a whole.

THE IMPORTUNITY OF LABOUR.

It has always been prophesied by those who have had experience of the methods of the Labour Party that they would never be satisfied with the recent Act passed to reverse the famous Osborne Judgment. They regard that as but a step in the great stairway of industrial reform which is to lead up to a kind of worker's paradise. The so-called representatives of the working man in the political world are now engaged in the task of "pressing for further legislation."

This is a policy which offers many attractions. It produces the maximum of advertisement with the minimum of result. The pressure exerted must, of course, be nicely adjusted. On the one hand, it must not be so great as to involve the leaders of labour in an open breach with the existing Administration, or the existing Administration in defeat. That would never do. It would be "killing the goose" in more senses than one. On the other hand, the pressure must be such, and must be so applied, as to secure as much notoriety as possible. The workers who read the halfpenny papers up and down the country must be told that their trusted representatives in politics are labouring in their interest. Resolutions must be passed at Congresses; these resolutions must be carried with all due pomp and circumstance (and expense) by influential deputations to Cabinet Ministers assembled at Whitehall. It is thus that the pro-

letariat are persuaded to believe that so much of the Trade Union funds as is subscribed for party purposes is being advantageously expended.

A favourable example of this up-to-date form of propaganda has recently been brought into prominence. It took the form of a deputation from the Parliamentary Committee of the Trade Union Congress to Mr. McKenna at the Home Office on April 8th. The object, apparently, was to draw the attention of the Home Secretary to certain resolutions passed at the recent Congress at Newport. The whole process rather reminds us of the archaic practice among European Monarchies, whereby, months after the demise of a Crowned Head, a state official is sent to "announce" the death. The deputation mentioned 25 resolutions, each one of which would require (according to the Home Secretary) to be dealt with by legislation. Let us mention a few of these at random :—Total provision for the blind ; closing of factories and workshops over the week-end ; prohibition of deductions from wages and the imposition of fines ; provision of means whereby a magistrate can pay a cab-driver reasonable expenses incurred in discovering a delinquent fare ; and amendment of the Workmen's Compensation Act so as to compel employers to insure.

According to the report in the *Times*, these are some of the topics dwelt upon by the deputation. The same journal reports the Home Secretary as having said :—

"He would only have been too glad to have introduced Bills on every one of the topics which had been raised, but there would not be the slightest chance of being able to get through more than a tithe of them."

We can well imagine Mr. McKenna, hand on heart, saying in a spirit of the utmost conciliation : "I and my colleagues have the inclination to confer these boons, but the exigencies of time prevent us." With similar candour did Mr. Spenlow declare, on his honour, that he would return willingly David Copperfield's premium, "but he had a partner—Mr. Jorkins."

We do not say for a moment that some of the suggestions put forward by this "deputation" did not fully deserve to be placed in the limbo of things for which there is no Parliamentary time. Take, for instance, the ridiculous proposal that factories and workshops should be closed over the week-end. How could the business of a great manufacturing community be conducted under such conditions ?

In the brief abstract of the proceedings which we have been able to consult, it appears that Mr. McKenna was loud in his expression of sympathy, but very careful not to commit himself or the Cabinet to any active step. That, as it seems to us, is exactly what the Labour Party want—accept legislation whenever it pleases the Government of the day to pass it, but by no means use threats or become aggressive if you do not obtain it.

The reappearance in the House of Commons of the Old Dog in a new doublet—the Minimum Wage resolution—is another example of what we have ventured to call the importunity of labour. Notwithstanding the teachings of experience this same old ridiculous resolution makes its appearance year after year. It is rather surprising to find, too, that it is meeting with support in quarters where opinion ought to be better informed. Space does not admit of our dealing at length with this question ; but there is one point we should like to make. It is that the minimum or living wage must necessarily be based on the cost of living for the time being. If that cost is increased, the so-called minimum must be increased. It follows that even if a minimum wage of 30s. were guaranteed to every worker this year, a few years hence, when the price of the loaf had gone up, the cry would be heard for an amendment of the minimum wage.

Nunits and Abbns.

The modern craze for abbreviation, and the insatiable passion for devising new units and systems of units, have lately given rise to a serious outbreak on the Continent, to say nothing of the isolated but equally sad case in the United States to which we recently drew attention. The disease appears to resemble influenza in that the germ or spore or whatever it be that disseminates the plague leaps over vast distances, leading to epidemics which appear to be quite independent, and that a single attack by no means safeguards the victim from a recurrence, but rather renders him more susceptible than ever to the complaint. From the boiled-down title of this essay on "New Units and Abbreviations" may be gathered some idea of the fearful prospect that would lie before us, should the virus attack the literature as well as the technical terminology of our time. What is the matter with the people who are constantly trying to foist upon a patient but sorely-tried world new and superfluous symbols and abbreviations ? It cannot be want of time to use the longer but obvious and customary forms, for the time they expend on elaborating and learning the new hieroglyphs would far more than swallow up the time they might save by using these. One dare not suggest that it is nothing but laziness, whatever one may think ; and therefore one is at a loss for a plausible explanation of this particular mental twist.

Our comments are prompted by a recent report of certain very eminent German Societies advocating the use of a set of abbreviations which we give on another page — not because we approve of them in the least, but for the information of readers who may come across them in German writings and will naturally be at a loss to translate them without this little glossary. We had thought of criticising the separate items, but, indeed, as Beatrice said of Benedick's bad parts, they maintain "so politic a state of evil, that they will not admit any good part to intermingle with them." We therefore will merely invite our readers to—"Look at them !"

The Benevolent Institution.

Our hearty congratulations are due to the Electrical Trades Benevolent Institution on the excellent result of the festival dinner, no less a sum than £854 having been added to the funds. It is worthy of note that more than half this amount was largely due to the personal efforts of the chairman, Mr. George Sutton, who has thrown himself into the work with an amount of zeal and energy worthy of the beneficent objects of the Institution, and has set a splendid example to future chairmen, not only in this respect, but also in his admirably conceived address in commending the Institution to the favourable regard of his audience at the dinner. His obviously sincere and heartfelt appeal should bear good fruit—and, indeed, it has already done so, as evidenced by the generous offer of Mr. E. Byng to contribute £100 to the funds if nine others would do likewise. Two such donors have already been found, in the persons of Mr. Sutton himself (whose large donation, as well as that of his firm, bears witness to the earnestness of his convictions) and of Mr. Hugo Hirst ; and we trust that the remaining seven will come forward well within the specified limit of three months. As we go to press, we learn with pleasure that Mr. E. Garcke will make a fourth donor of £100. We hope to add the other six names in our next issue.

We should like to direct particular attention to the chairman's remarks on the subject of donations from limited companies. As he pointed out, the welfare of employés undoubtedly falls within the legitimate range of a public company, and at a time like the present, when trade is flourishing, there ought not to be the slightest hesitation on the part of boards of directors in performing their duty in this respect.

THE MECHANICAL DESIGN OF SWITCHES.

By A. R. C. JENKS, A.C.G.I.

Electric driving of mechanical engineering works—generally by direct current—is now almost universal, and even a moderate-sized works may have in its equipment several hundred motors, supplying power for the large machines independently, the smaller ones in groups, and the various auxiliaries, such as cranes, air compressions, pumps, &c. Each of these motors is controlled by its own starting and operating switches, which are at the mercy of the men working the machines, who do not understand them and cannot be expected to appreciate their niceties. It is, therefore, surprising that the design of the majority of switches is still mechanically so imperfect, when the treatment they are likely to receive is considered. Improvements constantly tend in the direction of making them electrically rather than mechanically fool-proof; but this tendency is bound to lead to increased complications and therefore increased possibilities of mechanical breakdown.

In the most common type of starting switches—viz., the flat-segment type—the contacts and contact arm are mounted on a slate, marble, or composition base, and owing to the hard and non-resilient nature of these substances, it is difficult to prevent the small nuts and screws fixing the moving parts from becoming loose under the continuous rough usage to which the switch is subject; moreover, if it is of the open type most of the wear and tear is taken entirely by the base. In this respect the ironclad or protected type has the advantage, as the casing relieves the base of the mechanical strains; but this type is less accessible for repairs and is very heavy to take down and replace.

The chief fault of this simple starting switch is that it is easy to operate it too rapidly. This difficulty has been overcome in one design by moving the contact arm indirectly through a worm reducing gear by means of a second shaft to which the handle is connected. This is, on paper, an excellent idea, but practically the worm and worm wheel are not made nearly robust enough and consequently both are soon stripped. Another disadvantage is that the arrangements for holding the handle or worm in gear when starting, and releasing them when the arm is full over, are not satisfactory. In order to stop the motor and return the arm to the starting position, a neat little button is provided to short-circuit the no-volt coil; often, however, the arm sticks and will not release itself, and as it cannot be "assisted" from outside the casing, banging and jolting are resorted to until it goes back.

When overload releases are fitted they are also a source of weakness. Their parts are generally small; and, as they ought to go for months without operating, they are liable to get stuck, owing to gummy oil and grit in the joints of their mechanism. When a short does occur, and it is essential that they should act, they cannot be depended upon to operate within 50 per cent., or even 100 per cent., of the current set for; and since they usually cut out by short-circuiting the no-volt coil, they are open to the same objection as the push-button for stopping.

The strongest and most reliable controller is the drum type universally used for service motors on traction work and cranes. The drum is well supported and protected from mechanical damage by the very rigid casing. Unless, however, the "notching" gear and spring are amply strong and well designed, it is possible to stop the drum between notches, causing much damage to the fingers through continual arcing. The advantages of this type as regards durability are becoming more widely appreciated, and a modified form—the pillar-type controller—is being increasingly used for machine-tool motors.

Another point which, though not strictly concerned with mechanical design, might be noted, is that it is absolutely essential that proper "inching gear" should be provided for obtaining the very small movements often required when setting machines or taking out work. It should be possible to obtain just as small a movement with the machine light as when it is fully loaded.

Main switches with intricate toggle joints are liable to give trouble when the joint-pins begin to wear; this occurs fairly quickly, as they are generally too small and do not receive much attention in the way of lubrication. It is, however, scarcely possible to avoid these joints when heavy currents have to be broken by trip-gear incorporated with the switch.

Although, therefore, the "fool-proof" ideal appears attractive, advances in this direction can usually be obtained only at a sacrifice of mechanical simplicity, and this sacrifice is often too great. When the time lost during the course of a year through continual small delays caused by defects in switches is considered, it pays the user to insist on ample strength and simple design, thus ensuring that, instead of being generally defective, they will always be in good order. Reliance will have to be placed for protection from damage on fuses only, but these cannot easily go wrong, and wilful tampering can be avoided by enforcing severe penalties and by placing them under lock and key. It must be constantly borne in mind that the machinist regards his switches more or less in the same light as he regards his spanners, and treats them with about the same amount of consideration. Any extra expense to the user on heavier switches is likely to be amply repaid by reduction of lost time and of repair costs.

NOTES FROM CANADA.

[FROM OUR SPECIAL CORRESPONDENT.]

The Westminster B.C. Power Co. is preparing plans for a large hydro-electric plant on the Indian River. The idea is to utilise a number of small streams at high elevation, and run pipes down to the power house; the effective head of water will be about 1,800 ft.

The development of some 30,000 H.P. at the confluence of the Rivers Nicolum and Coquahalla, in British Columbia, is also contemplated by another concern.

The British Columbia Electric Railway Co. are building a large receiving station, which will contain four sets of transformers, each having a total capacity of 36,000 KW., stepping down from 60,000 volts to 11,000 volts.

Two towns in Western Canada, Vernon in British Columbia, and Canora in Saskatchewan, have recently put into operation Diesel engines driving generators, and as this type of plant appears to be particularly suited to the needs of many of the small, but growing, towns of the West, the performance of the plants already started will, no doubt, be watched with interest and, if successful, other similar installations are certain to follow.

Strathmore, Alberta, will probably have an electric light plant soon, as a company proposes to install two 65-H.P. producer-gas engines to drive two 35-KW. alternators, together with necessary transformers, lamps, meters, &c.

The Hydro-Electric Power Commission of Ontario intends to advertise almost immediately for tenders for the construction of a transmission line to Windsor from the main switching station at Dundas. The routes have not yet been decided upon, although four different ones are under consideration. The cost will amount to several million dollars, and all the towns along the route will be supplied with electricity. Tenders are also to be invited for material for the construction of transmission lines from Cannington to Beaverton, from Berlin to Elmira, from Clinton to Goderich, and from Brantford to Paris. The cost of material for these extensions will be about $2,000,000.

The Manitoba Government is erecting an experimental station at Estevan with the object of demonstrating the commercial possibilities of lignite. It is said that the matter of installing a large power plant near Estevan is now being considered by New York financiers, who will furnish the necessary capital immediately the feasibility of the scheme has been proved by the tests.

International Congress of Cold.—Papers offered to be read at the Congress in the United States in September next should be sent as soon as possible to the Secretary, 431, South Dearborn Street, Chicago, U.S.A.

CORRESPONDENCE.

Letters received by us after 5 P.M. on Tuesday cannot appear until the following week. Correspondents should forward their communications at the earliest possible moment. No letter can be published unless we have the writer's name and address in our possession.

Failure to Excite.

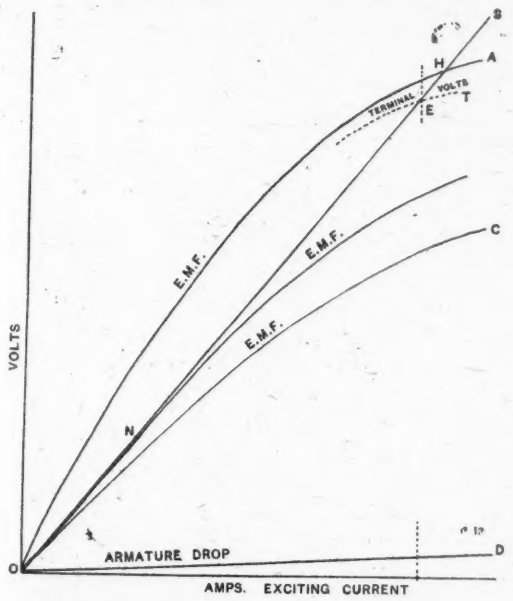
Without going more closely than necessary into considerations of shunt-dynamo "no-load characteristics," I think the following will suffice to explain the failure to excite of the small machine under mention.

The curves shown may be assumed, primarily, to indicate the behaviour of a separately excited dynamo under no-load conditions.

O S, which is a straight line, shows the variation of volts across the shunt coils, effected by varying the current round same, their resistance being assumed constant. Consistent with these field currents, and the speed at which the dynamo is running, the curve O C may be taken to represent, for illustrative purposes, the manner in which the E.M.F. of the armature under mention varies.

Now, a consideration of these two curves will show that for the machine to be self-exciting, it must be, so to speak, self-sustaining: in other words, the aforementioned curves must cut (or coincide) definitely, as shown, for instance, by O A at H.

A reference to O D will show the almost negligible drop due to the passage of the shunt current through the



armature. This small drop is allowed for on the curve O A, by plotting a portion of the terminal voltage curve, which cuts O S in E, just underneath.

Here we have an equilibrium of all conditions: the machine is able, when driven at the speed to which this E.M.F. curve corresponds, to generate from its self-produced field-flux an E.M.F. sufficient to overcome the small armature resistance, and urge the necessary current to maintain this flux round the field coils; this is the complete cycle.

It is possible under certain conditions—for instance, at too low a speed, other factors remaining constant—for the two curves practically to coincide for quite a considerable distance (see O to N on sketch). Where this is the case, the machine may assume any voltage along the line of approximate coincidence, since a momentary variation of any one of the prevailing equalising conditions may make the two curves exactly coincide somewhere along O N. I have noted practical instances where shunt generators have shown this erratic behaviour.

Without going further into detail, I suggest that either, or a combination, of the following more or less quickly attained methods will suffice to make the machine self-exciting:—

(*a*) Probably the most easily adopted:—Connect the field coils in parallel, and include an external resistance in circuit with these to cut down the current to its proper value.

(*b*) Increase the magnetic flux by lessening the air gaps, by careful packing at the backs of the pole pieces.

(*c*) Raise the speed.

Personally, I think a separately excited field, or some form of permanent excitation, would be the more suitable to employ, since the calibration of the scale would then be practically uniform over its whole range, and the disadvantage of what may be broadly termed a critical speed of excitation (other factors remaining constant) avoided.

In conclusion, it may be worth while noting that a bad connection in the shunt circuit, as suggested by Mr. C. V. Peake, would cause the curve O S to rise more abruptly than it should do; hence, no cutting of the curves would occur, and failure to excite would be the result.

W. T. Hilder, Grad.I.E.E.,
Mains Superintendent.

Aberdare, Glam.,
April 12th, 1913.

I have been reading with interest the answers to "Speedometer's" letter in your issue of the 4th inst.

When in India I often had dynamos to deal with which failed to excite, evidently through being knocked about in transit. In most cases there was sufficient residual magnetism to attract a needle suspended by a fine thread, so that having found the polarity it was easy enough to pass a small current through from a battery or other source. Where there was no evidence of any magnetism at all, it was simply a case of magnetising to suit the direction of motion required, or of altering the leads if it did fail to excite.

There was, however, one motor which I could never get to work as a dynamo. I had every connection thoroughly cleaned, and ran the machine first in one direction and then in another, with no result whatever. It worked easily enough as a motor, and when run separately excited, behaved in much the same way as "Speedometer's"—that is, I could not get it to give the maximum voltage. In both these cases there was sparking at the brushes. This could not be remedied by altering the lead. The brushes were diametrically opposite (it was a bipolar machine).

The armature was drum wound with wire of rectangular section, and to avoid the sharp curve at the back, the coils were in two halves, and the wires soldered together with a copper clamp. There was evidently a weak joint here which I was unable to discover, small in itself, but of high enough resistance to impede the small currents at the start off. I should not be surprised if "Speedometer's" motor is one of a similar make, and should be glad to hear from him if this is so.

E. G. Lazarus.

New Moston, Manchester.

[Regarding the "magnetising to suit the direction of motion required," our correspondent presumably means the polarity required; the direction of magnetisation has nothing to do with the direction of motion of a self-excited dynamo. —Eds. Elec. Rev.]

With reference to "Speedometer's" letter on the above subject in your issue of April 4th, if he finds that all the suggestions given up to the present are of no avail, I think it is very probable that the trouble is caused by the mica insulation, between the commutator segments, being too high. If he gets a fine saw and takes a little off the insulation all round the commutator, I fancy he will find that the machine will then excite. I know of several cases, with low-voltage machines, where this has been the cause of the trouble.

H. Orford.

Kidderminster, *April 21st*, 1913.

I should like to say, in reply to "Speedometer" on the above subject, that I had a similar experience with a low-voltage self-exciting dynamo failing to excite. After testing all connections, I found the trouble was due to

hard mica having risen above the commutator segments, causing a bad contact; and after cutting down the mica and cleaning up the commutator, the dynamo ran quite satisfactorily. I may here mention that when the dynamo was separately excited and fully loaded, it sparked slightly, this being due to the bad contact between brushes and commutator before mentioned, and would not give its correct voltage.

E. Wells.

Cambuslang, *April 21st*, 1913.

Prospects in Electrical Engineering.

I agree with Mr. Ebben's letter on the above subject. It is true that, generally speaking, one of the most interesting sections of the Electrical Review is the "Situations Vacant" column, but it is, at the same time, the most lamentable.

In my opinion, central station engineers can be divided into three classes:—Those who eagerly look forward to the day when the Electrical Review is obtainable, and who peruse it generally; those who can almost turn to the "Situations Vacant" columns blindfolded, and whose interest in the Review begins and ends there; and those who never even look at it at all.

Almost invariably one can on taking up a copy of the Electrical Review, which is undoubtedly the pioneer paper not only for reading matter, but for positions advertised, laugh at central station engineers.

Take, for instance, this week's issue (April 11th): An arc lamp trimmer is requested at a wage of 27s. per week, and the same firm requires a junior shift engineer at a salary of 28s. The fortunate engineer who gets the position will be presumably from 25 to 30 years of age, have served his apprenticeship, studied at a technical school, worked for years at a salary of a few shillings per week in order to gain experience. He will have to take on a position of responsibility, very probably work seven shifts, including night shift, which only tends to break up a man's constitution and shorten his days, also Sundays and Bank Holidays, &c., and will be subject to almost unbearable heat and din and risk of the engine room. And all this is for—what? A shilling more than the labourer who is required to trim arc lamps.

Concerning Mr. Ebben's suggestion that the heads of the various technical institutions should devote one hour per session to a lecture on "prospects on electrical engineering." This is a noble idea, and would certainly benefit members of the profession, but it would inevitably result in the "falling off" of students from the classes, if the plain truth were spoken. Obviously, it would not be in the principal's interest to give such a lecture. I remember some years ago, a distinguished engineer, Mr. Lloyd Barnes, giving a lecture on the matter at the opening of the session at the Liverpool Technical School, and stating that electrical engineering was the most difficult profession a young man could possibly follow. The effect of this and other remarks resulted in the decrease of over 50 per cent. in attendance at the next lecture, and at the finish of the session there remained only about a dozen students.

But leaving this point and in conclusion, to those of us who have already put "our hands to the plough," and spent some years in studying and acquiring experience, the only means of realising an improvement of our conditions, is, to use the words of Robert Burns: "When freedom, harmony and love unite us in the grand design."

A. C. Black.

Bootle, *April 14th*, 1913.

Salaries and Wages.

Referring to your interesting article on "Salaries and Wages" in the current issue (April 11th), the enclosed details of classification of employment and maximum wages for each grade, which has recently been agreed by the St. Marylebone Borough Council, may be of interest.

The first thing that stands out is the adoption of a minimum rate for men of whatever class. Although there is a maximum fixed for each of the grades, the intention is that a thoroughly competent man who has reached the maximum of his grade shall be transferred to the grade immediately above, if there is any possible vacancy. In some cases it can be done even if there be no vacancy. It is not intended that each man in each grade shall automatically reach the maximum, and there are no automatic annual increments provided for. An annual recommendation is made to the Electric Supply Committee each year as to the advance in wages which should be given, and each advance directly depends on each man's individual merit. An advantage of this grading is that it gives an intermediate course between an incompetent man and discharge; he can be severely punished by being placed in a lower grade, which punishment will frequently meet the case, whereas if no system of grading were in force, the man would probably be discharged.

This classification, of course, excludes myself and the four heads of departments: Secretary and accountant, generating engineer, mains engineer, and sales manager.

A. Hugh Seabrook,
General Manager.

St. Marylebone Electricity Supply,
April 15th, 1913.

St. Marylebone Electric Supply.

Approved by Council April 3rd, 1913.

Salaries and Wages—Classification of Grades for Permanent Employmemt.

Grade No.							Present No.	Establishment.
	Maximum wages for *unclassified* juniors:—							
1	Up to 16 years of age					15s.	24	
	Maximum wages for *unclassified* lads and youths:—							
2	Above 16 and up to 24					22s.	9	
	Minimum *Wages for Men for whatever Class.*							
3	25 years of age					25s.	6	
	26 years of age					26s.		
	27 years of age					27s.		
	28 years of age					28s.		
	29 years of age					29s.		
	30 years of age and upwards ...					30s.		
	Mimimum Wages for General Employment.					*Remarks.*		
4	Chief assistants ...	£6	0	0		Engineering	6	6
5	1st class asssistants	5	0	0		or	8	8
6	2nd class assistants	4	0	0		otherwise.	12	12
7	1st class clerks ...	3	0	0		Applicable	14	14
8	2nd class clerks ...	2	0	0		to	33	33
9	3rd class clerks ...	1	0	0		men or women.	10	10
10	Representatives ...	2	10	0		Plus bonus	14	14
11	1st class foremen	4	0	0			—	
12	2nd class foremen	3	0	0			7	
13	Leading hands ...	0	1	0	hr. or *pro rata* wky.		4	
14	Draughtsmen ...	3	0	0			1	
15	Assist. draughtsmen	1	15	0			1	
16	Painters	0	0	9	hr.		—	
17	Bricklayers ...	0	0	11	,,		1	
18	Carpenters & joiners	0	0	11½	,,		2	
19	Wiremen	0	0	11	,,		12	
20	Mates (all classes)	0	0	9	,,		14	
21	Storekeepers, head	2	10	0			3	
22	Storekeepers, assist.	1	15	0			—	
23	Handy labourers ...	0	0	8	hr.		16	
24	General labourers...	0	0	7	,,		22	
25	Dynamo and Motor attendants ...	2	0	0			4	
26	Switchmen ...	2	10	0			2	
27	Battery attendants	1	15	0			2	
28	Sub-sta. attendts.	2	10	0			4	
29	Drivers	2	10	0			5	
30	Stokers	2	15	0			8	
31	Volt regulators ...	1	5	0			—	
32	Fitters	2	10	0			5	
33	Meter testers and repairers ...	2	5	0			3	
34	Meter readers ...	2	0	0			10	
35	Meter collectors ...	2	5	0			1	
36	Jointers	2	10	0			5	
37	Box inspectors ...	1	15	0			3	
38	Lamplighters ...	1	7	6	Part time only		25	
39	Arc lamp trimmers	1	15	0			2	
40	Inspectors... ...	2	10	0			—	

With regard to Grade No. 2, this is designed to deal with employés who have not been specifically placed in one or other of Grades Nos. 4-40. Such cases will be few, and the grade is provided to give a small increase over Grade No. 1 until the employé is sufficiently skilled to pass into one of the other grades.

Grade No. 3 provides a minimum wage, and it provides for every man of 30 years of age in the department receiving a minimum weekly wage of 30s.

Grades Nos. 4-9 relate to sub-heads of departments and the clerical staff, and for these (and No. 10, the representatives) we have laid down a normal establishment, shown in the foregoing schedule, which corresponds with the existing employés who it is proposed should be allotted to these grades. This normal establishment should only be taken as the present figure, but no alteration therein will be made without the Council's knowledge.

For Grades Nos. 11-40 we do not think it convenient to lay down any fixed establishment in view of the fluctuating nature of some of the work, but the present numbers of each grade are shown on the schedule.

It will be noted that there are some grades (Nos. 11, 16, 22, 31 and 40) to which at present no employés are allotted, but we have thought it well to make provision for employés of these descriptions for the future.

Generally as to increments of wages, we do not, in any case, suggest a fixed increment, as we think the staff should be dealt with every year in the light of the year's working, and given such increments, within the maxima laid down, as may from time to time be thought desirable.

19-20, York Place *April 10th*, 1913.

Institution of Electrical Engineers.—Election of Council.

Many members of the Institution will, I believe, be disappointed with the Council's nominations to fill the vacancies on the Council. This for two reasons: that the constitution of the Council seems tending to become official rather than commercial; that the Local Sections have insufficient representation.

The renewed interest in the affairs of the Institution which has shown itself since Dr. Ferranti's presidency has been due, I think, to the feeling that the programme of development which he outlined would be followed, and that the Institution would become of real practical assistance to the industry. To this end should we not have a greater proportion of business men on the Council?

On the present Council the Local Sections have, in addition to their special representatives, Messrs. Dickinson, Faraday Proctor, Pearce and R. K. Morcom. All these gentlemen retire, and the Council's nominees, worthy of the highest honour though they may be, do not represent the provinces in the same direct manner.

The Local Sections want binding closer to headquarters; I believe this can be attained by fuller representation.

W. B. Woodhouse.

Dewsbury, *April 15th*, 1913.

The Preservation of Telegraph Poles.

We see in your issue of the 18th an article on "Preservation of Telegraph Poles," and we note that the author now talks of the brittleness of poles which have been creosoted. We do not think that this is a fact, and believe that if anything poles and timber which have been creosoted are stronger than the same unpreserved. We think that any Post Office engineer would bear us out in this contention. Perhaps you have room in your valuable paper to insert this contradiction.

With regard to the decay caused by wet getting inside poles, we can only reiterate what we have previously said, and always recommend users of poles that it is much better for any cutting and boring to be done before the poles are creosoted.

For **Richd. Wade, Sons & Co., Ltd.,**
Christopher Wade, *Managing Director.*

Hull, *April 21st*, 1913.

Electric Laundry Irons.

With reference to the remarks by "Ironical" regarding the above, I think it only fair to manufacturers to mention that my firm have been using electric laundry irons for the past two years. These irons are in constant use, and up to the present have been in every way successful. The flexible wiring has not, even in one instance, been renewed. The writer will be pleased to furnish any further particulars to anyone interested.

J. Martin M. Carr,
Manager, John Barker & Co., Ltd., *Electrical Dept.*

Kensington, W., *April 22nd*, 1913.

[Other communications on this subject will be found in our "Business Notes."—Eds. Elec. Rev.]

L.G.B. Arithmetic.

On page 640 of your last issue (April 18th) Mr. R. H. Hooper is reported to have made the following comments at Coventry:—

"There were just over 2,000 consumers of electrical energy out of a population of 115,000, so that practically *one-fiftieth* of the population were making a contribution to the relief of rates for the benefit of the others who did not happen to be users . . . ."

Those gallant 2,000! No wives, children, or households consuming the flashing fluid in order that the remaining 113,000 may live in domestic comfort at the usual average rate of five per family.

The electricity consumers of Coventry are indeed an example to the rest of the country.

Benedict.

ELECTROSTATIC CAPACITY AND INSULATION RESISTANCE MEASURED BY DIRECT-READING METHODS.

By J. RYMER-JONES.

Capacity test (by charge or discharge).—Employing a scale of 1,000 equal divisions, adjust the slide reading ($s\,r$) of the universal shunt so that the testing battery gives a throw of exactly 1,000 divisions for 1 microfarad. *E.g.*;—

If the shunt value $s\,r$ gives 1,000 divisions for 1 mfd., then 754 divs. = 754/1,000, or 0·754 mfd.
If the shunt value $s\,r$ be reduced to $s\,r/10$, then 754 divs. = 754/1,000 × 10, or 754 mfds.
If the shunt value $s\,r$ be reduced to $s\,r/100$, then 754 divs. = 754/1,000 × 100, or 75·4 mfds.

Using a Sullivan highly sensitive galvanometer (for use on shore), a shunt value $s\,r$ of 2,928 gave exactly 1,000 divisions from a standard condenser of 1 mfd. (fig. 1).

Substituting a drum of core for the condenser, and retaining the same shunt value ($s\,r$), a discharge of 611

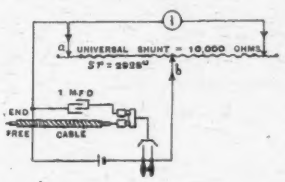


Fig. 1.

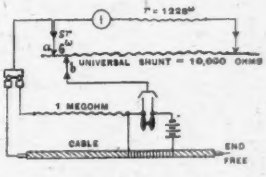


Fig. 2.

divisions given by the cable core therefore represents 611/1,000, or 0·611 mfd.

If it be preferred to get larger throws when the discharge reading is undesirably near to the zero end of the scale, it is simply effected by doubling $s\,r$ or $s\,r/10$, as the case may be, and dividing the throw by two.

Insulation resistance (by direct deflection method).—The diagram (fig. 3) represents a scale of 1,000 equal divisions, and also the same scale calibrated for resistance. If the galvanometer coil be so shunted that the testing battery, in circuit with one megohm, produces a deflection of 1,000 divisions, then the resistance represented by any other deflection (d) will be $1{,}000/d$ megohms; *e.g.*, a deflection (d) of 500 = 1,000/500 = 2 megohms.

The resistances corresponding to certain other deflections are given in the diagram by way of a graphic illustration of how the resistance (R) is in inverse ratio to the deflection, or R = $1{,}000/d$ megohms. That is to say, R is the reciprocal of the deflection multiplied by 1,000. Consequently, the resistance represented by any deflection is obtainable without calculation from Barlow's or other Tables of Reciprocals.

Having, therefore, adjusted the universal shunt reading ($s\,r$) so that the testing battery gives exactly 1,000 divisions through one megohm, the reciprocal of the deflection from

the cable, when the latter is substituted for the megohm, gives the absolute dielectric resistance R at any moment after applying the testing battery.

As one division low down the scale represents a much greater difference in the resistance than one division near to the 1,000 end, it is not desirable to read below (say) 200 divisions, *i.e.*, equivalent to 5 megohms when using a shunt value $s\,r$.

The same scale serves for higher resistances by proportionately increasing the shunt values as given below:—

For resistances between megohms ÷	Use shunt reading	Then R =
1—5	$s\,r$	Reciprocal of $d \times 1{,}000 \times 1$.
2—10	$2\,s\,r$	" $d \times 1{,}000 \times 2$.
10—50	$10\,s\,r$	" $d \times 1{,}000 \times 10$.
20—100	$20\,s\,r$	" $d \times 1{,}000 \times 20$.
100—500	$100\,s\,r$	" $d \times 1{,}000 \times 100$.
200—1,000	$200\,s\,r$	" $d \times 1{,}000 \times 200$.
1,000—5,000	$1{,}000\,s\,r$	" $d \times 1{,}000 \times 1{,}000$.

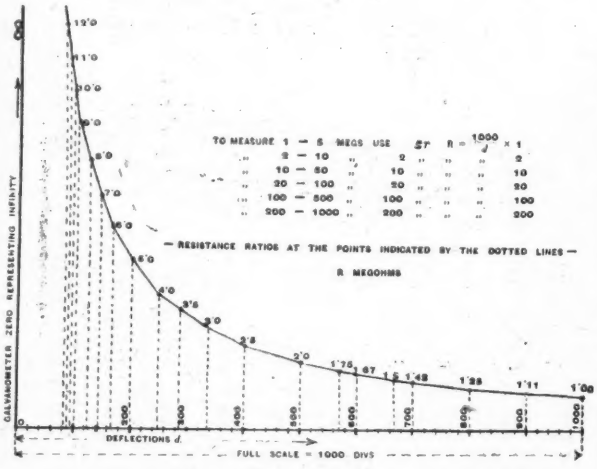
÷ The equivalent for a deflection of 200 divisions.

It will be noticed that if the deflection d is near to the 200 divisions when using, say, 10 $s\,r$, it will be much higher up the scale when using the next larger shunt value, viz., 20 $s\,r$, for testing the same insulation resistance.

Some years ago the writer employed such a scale as that shown in the diagram calibrated for resistance, from which to read directly the absolute D R values of condensers during manufacture, using different scales and shunts to suit particular limits of resistance.

The avoidance of figuring out results when many condensers had to be tested saved much time, and is easily practicable, because the galvanometer deflection in the factory is quite steady.

The modified *equally divided scale* method explained above is, however, more applicable to *core* and to *cable* testing, especially when a test is affected by *earth currents*, or by


TO MEASURE 1 — 5 MEGS USE
2 — 10
10 — 50
20 — 100
100 — 500
200 — 1000
— RESISTANCE RATIOS AT THE POINTS INDICATED BY THE DOTTED LINES —
R MEGOHMS
GALVANOMETER ZERO REPRESENTING INFINITY
DEFLECTIONS d
FULL SCALE = 1000 DIVS

Shunt galvanometer by $s\,r$ to make the testing current give through 1 megohm a deflection of 1,000 divisions, then resistances for any deflection are obtained direct from a table of reciprocals without calculation. R = 1,000/d megs.; d = 1,000/R.

Fig. 3.

induced and *undulating currents*, so disturbing to cable testing in the ship's tanks at sea, and which necessitate *meaning* several excursions.

Moreover, when testing a cable for D R by the usual *direct-deflection* method, one very important criterion as to its electrical soundness is the regularly decreasing *differences* between *minute* readings, and also the strict comparison between the (say) "negative," "earth," and the subsequently observed "reversed current" readings, according to the usual routine.

It will therefore be obvious that a scale calibrated for resistances is not so suitable for cable testing as an equally divided scale; and as the reciprocal of the observed deflection is obtained from Barlow's Tables, and therefore the D R value obtained by inspection, the method is practically *direct reading*, in so far as it obviates calculation.

Adjusting the shunt ($s\,r$) to give 1,000 *divisions through* 1 *megohm.*—If the galvanometer be very sensitive, necessitating a very low $s\,r$ value, a difference of 1 may be excessive; this is easily remedied by using the higher value for $s\,r$, and reducing the resulting deflection to exactly 1,000 by adding resistance (r) to the galvanometer coil circuit; *e.g.*, employing a highly sensitive Sullivan galvanometer, a testing battery of 600 volts gave a deflection of about 1,020 divisions when using a universal shunt value ($s\,r$) of 6; and putting 1,228 ohms in series with the galvanometer coil brought the deflection to exactly 1,000. (Fig. 2.)

Substituting 1·6 N.M. of cable core for the standard megohm, and increasing $s\,r$ from 6 to 6,000, *i.e.*, increasing the shunt value 1,000 times, the same testing battery gave—

1st minute (d) = 854 divs., the reciprocal of which is 0·001171, and the D R ... ... = 1,171 megs. abs.
Or $\frac{1000}{854} \times 1{,}000$ ... ... = 1,171 megs. abs.

When thoroughly discharged and tested by the ordinary method the calculated D R was as nearly as possible the same.

Long *single* scale for factory or laboratory.—
Distance from galvanometer mirror to scale ... 12 ft. 6 in.
Length of 1,000 divisions ... ... 4 ft. 6½ in.

Short *double* scale for cables subject to earth current disturbances.—
Distance from galvanometer mirror to scale ... 3 ft. 6 in.
Length of 500 graduations (each representing two divisions)* ... ... 1 ft. 3 in.

* The graduation is the same on both sides of zero.

PARLIAMENTARY.

City and South London Railway.

A Select Committee of the House of Lords, of which Lord Sanderson is chairman, commenced the consideration on April 17th of this Bill. The Hon. J. D. Fitzgerald, K.C., appeared for the promoters, and there was a large number of opponents, including the Bank of England and several insurance offices, who were represented by counsel.

The Hon. J. D. Fitzgerald explained that the railway was the pioneer in tube railway construction in this country. At the time it was built, it was thought that a tunnel of a width of 10 ft. 2 in. would be sufficient, but when other tubes came to be constructed the tunnels were made larger in diameter. The chief object of the present Bill was to enable the company to increase the size of the tunnels to that of other tube railways, so as to secure quicker running, a more frequent service, and improved rolling stock. During the morning and evening rush hours the company found great difficulty in accommodating the passengers who wished to travel, and it was that difficulty which had prevented the line being extended beyond its present termini at Clapham Common. The largest number of trains which could be run at present was 24 per hour, which, with five carriages per train, enabled 4,320 passengers to be carried. When, however, the tunnels were enlarged they would be able to put on 40 trains during the hour, each composed of seven carriages, with a seating capacity which would enable nearly three times the present number of passengers to be carried. Counsel went on to explain that under another Bill which would come before the Committee the Charing Cross, Euston and Hampstead Railway Co. were asking for powers to construct a line from their present Camden Town Station to Euston, where it was proposed to connect up with the City and South London line. If that scheme was sanctioned it would be possible to run through trains from Clapham Common in the south, to Highgate, Hampstead and Golder's Green in the north, which would be a very great convenience to the travelling public. Mr. Fitzgerald said he was unable to account for the opposition of the Bank of England and the other City firms, because this was not a proposal to construct a new line. It was a line which had been working for years without doing damage to anyone, and all that was now desired was to slightly enlarge the diameter of the tube. It was proposed to work the line in the same way as other tube railways were worked—by a system of supplying the motive power to the wheels of each carriage, thus getting rid of vibration and dispensing with the use of a locomotive.

Evidence in support of the Bill was given by Mr. Albert H. Stanley, the managing director of the company, and Mr. C. B. Stuart-Wortley, M.P., the chairman. Mr. Stanley stated that the accommodation which the company was able to offer was very inferior to that which was given by the later tube railways, and the result was that the traffic had shown a falling off of late years. Up to a point the company was fairly successful, and the traffic steadily increased; but some years ago it ceased to expand, and it had since gone back. If they could bring the tunnels up to the

same diameter as the other tube railways, and run similar coaches, he believed the traffic would again increase.

After hearing further evidence in favour of the Bill, the Committee found the preamble proved, but held over the consideration of clauses until they had disposed of the next Bill on their list.

Metropolitan Railway Bill.

(*Concluded from page* 636.)

Mr. William Willox, the engineer of the Metropolitan Railway Co., explained the engineering details of the two extensions. The first extension from Moorgate Street to Lothbury was, he said, about 502 yards long, and the two tunnels would be about 54 ft. 6 in. below the surface of the pavement. He had put in a proviso to the effect that they would not deviate upwards to such an extent as to bring the rails within 45 ft. of the surface of the road. It was proposed to construct the tunnels by means of shields with compressed air. They would be 16 ft. in diameter, which was rather larger than the ordinary electric railway tunnels. They did not encroach upon any private property. The length of the extension to link up the line with the Waterloo and City Railway was about 250 yards, and in that case the tunnel would be 12 ft. in diameter.

Sir Douglas Fox also gave evidence in favour of the Bill. He said that he was engineer for the Bill of the Great Northern and City Co., in 1902, and on that occasion he satisfied Parliament that the extension to Lothbury could be safely carried out. Since that time, both engineers and contractors had had a good deal of experience as to the construction of tube railways, and by the use of compressed air he thought they had greatly minimised the possibility of injury along Moorgate Street. He regarded it of very great importance that the compressed-air method of construction should be employed in order to prevent the possibility of damage. In the estimates they had allowed £16,000 for compensation in respect to the Waterloo and City extension and £4,000 for the extension to Lothbury.

Mr. C. L. Morgan, chief engineer of the London, Brighton and South Coast Railway Co., giving evidence in support of the Bill, said that the extensions did not present any engineering difficulties.

Similar evidence was given by Mr. H. Dalrymple-Hay, C.E., Sir A. Stenning, and Mr. J. F. Middleton, a contractor.

Mr. G. J. Talbot, K.C., addressed the Committee on behalf of the petitioners against the Bill, and laid stress upon the fact that at one point the crown of the Central London tube would be only 1 ft. 6 in. below the new line. A very slight subsidence might cause serious consequences to wells, hydraulic lifts and the strong rooms of banks.

After hearing further evidence from a number of property owners who opposed the extensions on the ground that their property would be endangered, the Committee decided that the Bill might proceed so far as the proposal to extend the Great Northern and City line from Moorgate to Lothbury, subject to the conditions laid down in the Act of 1902. They rejected the proposal to give a connection with the City and Waterloo line.

London Electric Railway Bill.

On Monday the Committee proceeded to consider the Bill promoted by the London Electric Railway Co., which is opposed by the London County Council and the Hammersmith Corporation.

Mr. Balfour Browne, K.C., in opening the case, said that the Bill sought powers to extend the Great Northern, Brompton and Piccadilly Railway at Hammersmith to a junction near Ravenscourt Park with the Kensington and Richmond branch of the London and South-Western Railway. It further proposed a junction between the Hampstead, Euston and Charing Cross Railway and the City and South London Railway on the widened tunnel. The London County Council wished the Committee to reject Clause 40 of the Bill, which gave the company power to carry out work beneath the public streets without compensation for the removal of the subsoil, the rights of which are vested in the Council. Mr. Balfour Browne said that the promoters were simply giving effect to the ordinary law in the clause which had laid it down that where a company used sub-soil which was at such a depth below the surface of a public street that it was of no practical value to the public, they should not be obliged to pay compensation.

Mr. Freeman, K.C., said that the position of the London County Council was that the railway would run down Northumberland Avenue and Southampton Row—thoroughfares which had been improved very largely at the public expense. In such a case, the Council thought it only right that a company wishing to go underneath such thoroughfares should be compelled to pay the Council something towards the cost of the improvement.

The Committee decided that they would allow the clause to stand, and the preamble of the Bill was declared proved.

Central London Railway Bill.—All opposition to the Central London Railway Bill has been withdrawn, and consequently it has been taken from the group down for consideration by Lord Sanderson's Select Committee.

Richmond (Surrey) Electricity Supply Bill.—The Standing Orders Committee of the House of Commons has decided that the Standing Orders in the case of the above Bill may be dispensed with, and that the Bill shall be allowed to proceed.

Leeds Corporation Bill.—The Standing Orders Committee have decided that the Leeds Corporation may proceed with their Bill, on condition that Tramway No. 6 is struck out.

Herne Bay Gas and Electricity Bill.—The Unopposed Bill Committee of the House of Commons has passed the preamble of the above Bill, which, amongst other things, gives power to the Herne Bay Gas and Coke Co. to supply electricity within the Urban District of Herne Bay.

NEW ELECTRICAL DEVICES, FITTINGS AND PLANT.

Plexsim Sealing-Wax Heaters.

Messrs. Simplex Conduits, Ltd., of 116, Charing Cross Road, W.C., have recently given attention to the development of electrical sealing-wax heaters, which, in view of the outbreaks of fire that have occurred with non-electric types, ought to be very favourably received in factories where much packing in sealed parcels is carried on. Two patterns have been designed, of which we give illustrations herewith.

In the case of the "Plexsim Industrial Pattern," shown in fig. 1, the sealing-wax is placed in the inner receptacle, and is allowed to run over the two slopes at either end, which are also heated to prevent the wax from cooling down; it can be picked up by the

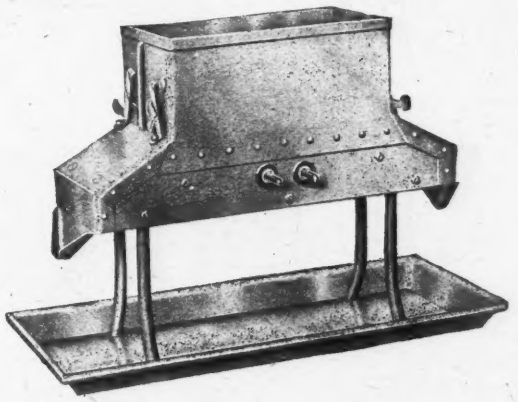


Fig. 1.—Plexsim Sealing-Wax Heater, Industrial Type.

flaps of the parcels to be sealed. Where it is required to make use of an ordinary seal impress, the wax can be allowed to run down the slopes, which are specially shaped at the bottom to allow it to drop off. The amount flowing out of the central chamber can be accurately regulated by opening or closing the apertures with the small shutters provided. Any excess wax is caught in the

Fig. 2.—Plexsim Wall-Pattern Sealing-Wax Heater.

tray upon which the heater stands and used again, thereby guarding against waste. The appliance is substantially constructed in black enamelled iron, and being double-ended, allows two persons to work with it at the same time.

The wall pattern, shown in fig. 2, is intended for the use of chemists, and in other trades where a large quantity of small packages require sealing. It is specially suitable for use where the ordinary hand seal impress is used, or where the packages are small and require sealing in a number of different positions. The heater is made suitable for fixing to the wall, and for use with the ordinary sealing-wax supplied in sticks. The latter is pressed on to the heated cast-iron point, which is so shaped as to allow the melted wax to fall off the point in the form of small drops suitable for receiving the impress.

The appliance is solidly constructed, and the heated portions are insulated and ventilated from the base upon which it is mounted, which always remains cool. The heater is ready for use in three or four minutes from switching on. The energy consumption is so low, however, that it may be kept continually in circuit without undue expense, and may be connected to any convenient lampholder.

Gate-end Box for Docks and Mines.

The gate-end box which is shown in the accompanying view, fig. 3, and for which the General Electric Co., Ltd., of 67, Queen Victoria Street, E.C., are responsible, consists of a standard ironclad switch and fuses, with the usual device for preventing the switch cover being opened with the switch at the "on" position. This switch is interlocked with the plug, to which is connected the flexible cable running to the motor. This interlock refuses admission to the plug with the switch closed, and prevents the plug from being withdrawn with the switch closed. The earthing conductor is brought back from the motor to the plug, and here it is connected to special terminals, which make contact with others in the plug socket. These contacts are so arranged that the first thing done on the insertion of the plug is the completion of the earth circuit, and the last thing on its withdrawal is the breaking of the earth circuit. The result is that the motor can never be under pressure with the earth connection unmade. It will be observed from the illustration that the lower part of the interlocking bar is protected from any blows that might do damage by an iron tube. The interiors of the switch and fuse cases are well protected against arcs, and adequate clearances are given between the fuses and case and between the switch blades and case. It will be remembered that the Home Office has recently called attention to the fact that many switches are defective in this respect.

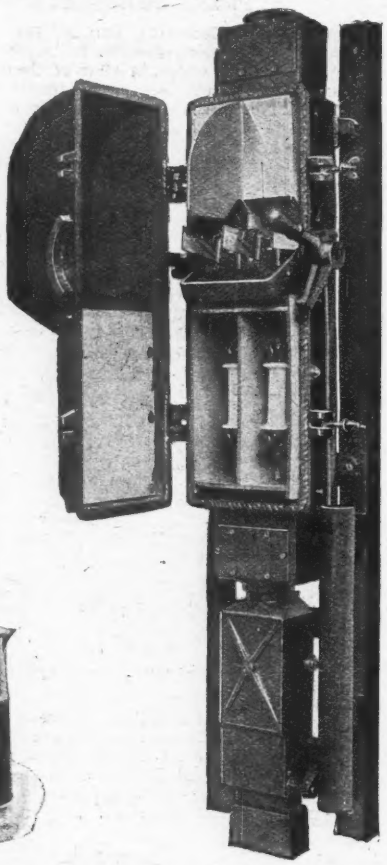


Fig. 3.—G.E.C. Gate-end Box for Docks and Mines.

Fig. 4.—Stoneware Boiling Jug.

Stoneware Electric Utensils.

A neat novelty has been introduced by Messrs. Baxter and Caunter, Ltd., of 219, Tottenham Court Road, W., under Hosgood's patents, in the form of a series of stoneware utensils provided with electric heaters, as illustrated in fig. 4, which shows a one-pint boiling jug. The heating element is placed round the lower part of the vessel, and is protected with an insulated metal cover; being in actual contact with the stoneware, it communicates heat to the latter very quickly, and on trial with a two-pint jug we find that less than 10 min. suffices to boil a pint of cold water. The jugs can be used for heating water, milk, beef-tea, &c., or cooking eggs, and a shaving pot is made on similar lines. The socket is adapted for direct connection to an ordinary lampholder. Other patterns are in course of preparation. These utensils are much cheaper than metal ones.

LEGAL.

Schloss & Co. *v.* Dodd.

In the City of London Court, on April 17th, before his Honour Judge Rentoul, K.C., an action was brought by Messrs. Louis Schloss & Co., electric lamp manufacturers, 3, Rangoon Street, Crutched Friars, E.C., against Mr. Edward H. Dodd, electric lamp dealer, 11, Old Bond Street, Bath, to recover the sum of £2 4s. for electric lamps supplied. There was no dispute about the order or delivery of the lamps, but the defendant said that they were defective. Judge Rentoul observed that the burden of proving that was on the defendant. When a man received electric lamps and he raised as a defence that they were not fit for the purpose for which they were supplied, he had to prove it.

Defendant said that he tested the lamps when they arrived, and then he wrote to the plaintiffs and told them that they were defective. He first tested three lamps. The filaments went, and the plaintiffs sent him three more which were no better than the others. Then he went through all the lamps and returned the lot to the plaintiffs.

Judge Rentoul pointed out that substituting three others might be an admission that the original ones were wrong, or it might be an endeavour to avoid litigation.

Mr. Morley, plaintiffs' solicitor, said that the lamps were supplied in November and defendant gave a post-dated cheque to February 10th, which was returned twice marked "Not provided for." No lamps had been exchanged as alleged; others were sent as ordered.

Defendant said he told plaintiffs that he would not meet the cheque as the lamps were defective.

Mr. Morley said that the lamps had not been returned to the plaintiffs. They were sent back, probably, but were delivered to someone else on the premises. There was no complaint about the lamps being defective until the cheque was stopped.

Judge Rentoul said it would not do for the defendant to keep electric lamps for several months, and then say they were defective. If he had written at once and said that the lamps were wrong, it would be another question. It was not fair to keep lamps, send a cheque, and then say that they were bad.

Defendant said he gave the cheque in February, not in November, as the plaintiffs said.

Judge Rentoul said that the defendant had put himself in the wrong by keeping the lamps as long as he did. There was no complaint for several months.

Judge Rentoul gave judgment for the plaintiffs for the amount claimed, with costs.

Quinn *v.* Sunderland Corporation.

At Sunderland County Court on April 17th, before Judge Bonsey, Mrs. Margaret Quinn brought an action against the Sunderland Corporation to recover damages in respect of injuries received while a passenger on one of its tramcars.

Mr. Mundahl, for the plaintiff, said Mrs. Quinn was 70 years of age. She and her son proceeded to get on to a car, and as she was making an attempt to reach a vacant seat, the vehicle started with a jerk. As a result, Mrs. Quinn was thrown. Her nose and her wrist were broken. The plaintiff claimed £5 for the doctor's bill, £2 9s. for special nourishment and £3 for loss of employment. She also claimed that she was entitled to additional damages for pain and suffering.

Judge Bonsey: Your view is that a conductor should not start a car until all the passengers are seated. That is not the general practice.

Mr. Mundahl: That is so, but a conductor starts a car at his own risk, and he should take special care in the case of elderly and infirm persons.

Judge Bonsey said he could not find that the conductor of a tramcar was bound to delay starting his car until all the passengers had seated themselves at their own pleasure. The only obligation on him was to give reasonable time for them to be seated and if they were not seated then it was at their own risk. He was convinced that in this case the conductor had led the lady to a seat, and had given her reasonable time to sit down, but she did not take advantage of the time given her. He, therefore, gave judgment for the defendants.

A formal order for costs was made, but it was understood that it would not be enforced.

Action against Dundee Corporation.

The record has been closed in the Sheriff Court in an action at the instance of a motor lorry company against the Corporation. It is alleged by pursuers that a lorry belonging to them fell through an improvised roadway, which had been opened up by the Town Council, for the purpose of laying an electric cable. They claim £50 as damages.

Sentence for Stealing.

An extraordinary series of thefts from the Glasgow Corporation's tramcar building and repairing works at Coplawhill, extending over a period of six years, was disclosed in the Sheriff Court on Thursday, last week, when a foreman electrician, James Pollock, was charged. Accused pleaded guilty to having, between January 1st, 1907, and February 25th, 1913, stolen 2 tons of armature coil

copper wire, 6 cwt. of copper commutator bars, 9 cwt. of block tin, and 25 miles of insulated copper wire, valued at about £800. Pollock had been in the service of the Corporation for 15 years, and had a wage of £3 per week. Unfortunately he had fallen into bad company, and, to increase his means, had sold these articles belonging to the department.

Sheriff Boyd, in passing sentence of six months' imprisonment with hard labour, said that while this might be the first charge brought against the accused, it was a very serious one.

National Telephone Arbitration: Question of Costs.

Before the Railway and Canal Commission (Mr. Justice A. T. Lawrence, the Hon. A. E. Gathorne-Hardy and Sir James Woodhouse) was mentioned on Monday last the case of the National Telephone Co., Ltd., *v.* His Majesty's Postmaster-General.

Sir Alfred Cripps, K.C., on behalf of the company, asked that the taxation of costs might be on the higher scale. His Lordship, he said, had not expressly mentioned that it should be, but it was usual to allow higher scale costs in exceptional cases, and he thought he might say this was an exceptional case. He did not know what attitude the Attorney-General would take, but all parties were desirous that the taxation should go on.

The Attorney-General (Sir Rufus Isaacs, K.C.) said he did not desire to question the costs being given on the higher scale. It was a question entirely for his Lordship, and he, therefore, did not desire to put forward any argument. His Lordship knew all about the case, and anything that was reasonable and right they were prepared to do. They did not want to pay more, and at the same time they did not want to pay less than his Lordship should think was reasonable and right.

His Lordship, after consultation with the other commissioners, said that they thought the taxation ought to be on the higher scale.

Sir Alfred said he was obliged to his Lordship, and under these circumstances the matter could go forward.

Solomon *v.* Wells, Rayner & Co., Ltd.

On Saturday last, in the King's Bench Division, before Mr. Justice Rowlatt, an action was brought against defendants, electrical engineers, of Paddington Street, W., by Mr. David Carvalho Solomon, who was formerly in their employ.

Mr. R. P. G. Johnson, on behalf of plaintiff, stated that his client sought to recover £126 8s. 6d., for commission due and payable under an agreement dated March 25th, 1912, by which defendants agreed to pay Mr. Solomon a commission of 2½ per cent. on defendants' turnover in their electrical business above £4,000, for a period from January 1st, 1912, to December 31st, 1912, including net cost of work in hand at December 31st, 1912, such commission to be payable before January 31st, 1913. Defendants had paid into Court and admitted liability of £99 1s. 10d. out of the £126 8s. 6d. The position was, explained counsel, that the defendant company, which he understood was a private company, carried on business as dealers in electrical supplies. In May, 1911, plaintiff entered their employment when something was said about giving plaintiff an interest in the business, and it was agreed that he should receive besides his salary, a commission on the turnover above £4,000. It was explained to Mr. Solomon that the business was carried on in such a way that until they had a turnover of £4,000, there would be no profit accruing. Mr. McClelland, the chief shareholder and managing director of the business, told plaintiff what the amount of business was for the current year up to that time, but explained that they expected to double it during 1912, and said that the £4,000 had already been reached during the first three months of that year. There was also some mention of a large country job in particular, the order for which had been given in 1911, and upon those representations, Mr. Solomon himself drew up a form of agreement, but although Mr. McClelland objected, he signed it substantially in the form in which plaintiff had drawn it up, by which plaintiff was to receive £2 a week and 2½ per cent. on the turnover over £4,000, including net cost of work in hand at December 31st, 1912. Nothing further came of the matter until a day or two before the agreement ran out, when Mr. McClelland asked plaintiff whether he felt he was entitled to commission on 1911 orders.

His Lordship: The whole question is the application of the word "turnover."

Mr. Johnson agreed, and said the trouble was as to the work remaining unfinished at the end of 1911.

Mr. Coumber, on behalf of the defendant company, said that the plaintiff knew when he entered into the agreement, exactly what was intended by the word "turnover," and he was now trying to introduce into the agreement something which it was never agreed between the parties should be in it. The balance-sheet was produced to plaintiff at the time, and the method that was adopted for arriving at the turnover on which the commission should be based was quite usual.

After hearing evidence on both sides and considerable legal argument, his Lordship said he saw so many reasons for deciding in favour of both sides, that he would consider his judgment.

On Monday Mr. Justice Rowlatt delivered judgment. He said that the point in dispute merely involved the construction of a document, but the evidence and arguments made it necessary that he should carefully consider the decision to which he had come. The plaintiff made an agreement with the defendants, a firm of electrical engineers, to serve them for a year, and they agreed to pay him a commission of 2½ per cent. The defendants had put forward accounts for the purpose of calculating the commission showing the full amount of the invoices rendered during the year, and added to that was the net cost of the work in hand. There was no dispute as to those figures, but they had deducted the net cost of work in hand at the beginning of the year, which it was said they had no right to do. The plaintiff contended that the turnover of the company meant the amount of the invoices rendered during the year. He said that if the turnover was to be taken as involving the exclusion of work unfinished at the beginning of the year, then the clause which said, "including work in hand in December, 1912," was of no effect at all. He said that in order to give meaning to those words, they must adopt his construction that the word "including" meant in addition to. Of course, the more accurate turnover was the actual work done in the year, which involved the exclusion of the beginning part. On the other hand, the defendants said that the plaintiff was paid by salary up to December 31st, 1911, and was not paid by commission at all, and that he, therefore, had no interest in work being done up to that time. When they came to the following year the contract was that he was to be paid by commission on the business of the company for the period during which he engaged himself to serve under the agreement. He (the judge) had come to the conclusion that the defendants were right. He thought that the governing consideration actually was that the plaintiff was going to serve for a year, and that he was to be paid by commission on the volume of business done during that period only, and not something more. He had had his salary up to the end of the preceding year. The best construction his Lordship could put upon the agreement was that it was to be assumed that he was not to be paid commission during the period he was being paid by salary. He, therefore, gave judgment for the defendants, with costs.

Judgment was entered accordingly.

Important Appeal Case *re* Factory Acts.

At the Middlesex Sessions, held at Caxton House, Westminster, on Monday, before Mr. Montagu Sharp and a bench of magistrates, the appeal of the North Metropolitan Electric Power Co., Ltd., was heard against two convictions on June 26th, 1912, by the Highgate Magistrates for committing breaches of Rules 18 (*d*) and 28 of the Home Office Regulations regarding the generation, transformation and use of electricity in factories and workshops.

Mr. Bodkin appeared for the appellants, and Mr. J. Hunter Gray and Mr. Boyd for the respondents.

Mr. Gray said the appeal was with respect to two convictions, but it would be convenient to take them together. The convictions were for failing to comply with certain regulations which were issued under the Factory Acts of 1901 and 1907 to govern the proper protection of electric supply companies' works. The drawing he had put before the Court was the Finchley sub-station, which was supplied with electrical energy from the main station at a very high voltage. Energy was supplied by this sub-station to the Metropolitan Tramways Co. for the purpose of driving their tramways and lighting them, and for some other subsidiary work. In the room of which he produced the drawing the voltage was 10,000 volts. It was not necessary that each conductor should be of 10,000 volts, and they were agreed that the voltage which was exposed in the case they were considering was something like 6,000, and strict precautions had to be taken to prevent anyone coming in contact with a conductor carrying such high voltage, especially as, unlike other sources of danger, one could not see that the danger was there. The result of the alleged failure on the part of the appellants was that a man was killed. Counsel proceeded to direct the attention of the Bench to the drawing of the room, and pointed out the cable coming in from the main station bringing in electrical energy at 10,000 volts. There was also an X on the drawing, which showed a porcelain tube. It was at this point that a part of the conductor was bare, and it was at this point that the young man who was killed came in contact with the conductor. The workman who was killed, whose name was Arthur Shapcot, had the duty of cleaning certain parts of the machinery, and on March 25th, 1912, during the night he was cleaning the part just above the bus-bars. There were three inverted troughs, and above that there were the pressure limit resistances. A great deal of dust got on to these, and therefore it was necessary for them to be kept constantly clean. The young man was told to clean these pressure limit resistances, and in order to do that he had to get up from the floor, because the height of the pressure limit was about 10 ft. from the ground. He appeared to have got on to the right-hand oil switch cell, and from that position to have dusted part of these resistances. Then by some means or other, he appeared to have gone over to the left-hand oil switch cell, so as to finish the cleaning of the resistances from that side. Unfortunately, while he was there his left wrist appeared to have come into contact with the bare conductor at the part marked X on the drawing, and he received the whole 6,000 volts and was killed. He submitted that the purpose of the rules of the Home Office was clearly to provide against accidents of this kind, and what the legislature had done, and what had been found in practice to be the necessary thing, was that persons who had to do with such apparatus, should make the whole of the room dead. In this case the particular part of the room where the young man was working was dead, but unless the adjoining parts of the apparatus were also dead there was still danger and liability to accident. Therefore there was an alternative provision made in the regulations that if they only cut off sections of the room they had to properly screen off the adjoining parts so that accidents might be avoided. The contention of the prosecution was that the part marked X should

have been properly screened off so that the young man in going on to the left-hand oil switch for the purpose of cleaning could not, under any circumstances, have come into contact with the bare metal. Substantially that was the whole case. Rule 28 read: "(28) No person except an authorised person or a competent person acting under his immediate supervision, shall undertake any work where technical knowledge or experience is required in order adequately to avoid danger; and no person shall work alone in any case in which the Secretary of State directs that he shall not. No person except an authorised person or a competent person over 21 years of age acting under his immediate supervision, shall undertake any repair, alteration, extension, cleaning or such work where technical knowledge or experience is required, in order to avoid danger, and no one shall do such work unaccompanied." On the night in question, the young man was accompanied by his superior, Thomas Styles, and the contention of the prosecution was that he was neither an authorised person nor a competent person over 21 years of age. To see what an authorised person was they had to look at the definition, and it was there laid down:—"'Authorised person' means (*a*) the occupier, or (*b*) a contractor for the time being under contract with the employer, or (*c*) a person employed, appointed, or selected by the occupier, or by a contractor as aforesaid, to carry out certain duties incidental to the generation, transformation, distribution, or use of electrical energy, such occupier, contractor or person being a person who is competent for the purposes of the regulation in which the term is used." Whether this young man was competent as defined by the regulations was of course a matter of opinion, but, *primâ facie*, he would say that the very fact of his being killed was to some extent evidence that he was not competent.

Thomas Geo. Styles said he was 26 years of age, and was at the Finchley sub-station. He remembered the accident to Shapcot, who was his assistant. Witness was in charge of the room in which the accident took place. Shapcot was on duty on the night in question, and was instructed to clean the pressure limits. Witness was standing on the platform higher up than the deceased. At the time of the accident the bus-bars on the left-hand were completely dead. He saw a great flare where Shapcot was standing, and went to him, and found that something was wrong and called assistance, and it was found he was dead. The only mark he saw was on the deceased's wrist. The deceased had a piece of white rag in his hand, and was dusting the resistances. He did not know how the deceased got where he was. The union just inside the insulator was bare.

In cross-examination, witness said he gave evidence at the inquest on Shapcot, and the jury exonerated him from all blame. He had been over six years in the employ of the company. He started at the Finchley sub-station, and was under Mr. Hunt, the sub-station engineer in charge. He was promoted to be charge attendant. Before being promoted, Mr. Hunt observed his work, and questioned him from time to time. The cleaning was carried out once a week by different shifts. The work was done at night, and it came to the turn of each shift once in the week. Shapcot had worked five or six times with him, and had done the very work they were doing when the accident happened. Shapcot was an active man, and was very keen on his work. He understood deceased had had three terms technical instruction at the Tottenham Institute. He found the deceased very competent. He knew under the regulations that he would not be allowed to work if incompetent, and there had been nothing to make him regard Shapcot as anything but a perfectly efficient assistant. On the night in question he told the deceased to do his work. Deceased used the same ladder as he did to get to do the right-hand oil cells, and when he got there he was in his accustomed place for doing the work where he had been on previous occasions. The oil or brick cells were about 6 ft. high. From the position in which the deceased usually stood he could by stretching have done all the work required. He would of course have either to straddle over or crawl under certain cables.

Counsel, by means of the model, took the witness over the position occupied by the deceased on the night in question, and witness pointed out the cables which were dead. There were various positions in which the deceased could have done the work, and witness would have had no hesitation in climbing anywhere about on the right-hand side. The bus-bars on the No. 1 side that night were disconnected. From the time he saw the deceased doing his work to the time he saw the arc, and knew there was trouble, was hardly any time. He dropped his screwdriver, and, after stooping to pick it up, he saw the deceased on the other side of the passage, and saw the arc. Counsel took witness through a list of a number of other duties carried out by deceased, with the object of proving that he was possessed of very considerable technical knowledge and skill. Had he questioned the deceased on whether the different apparatus in the room were live or dead he could have told him. From his knowledge of the place, the deceased ought not to have been on the left-hand side at all, and there was no necessity for him to be there for the purpose of doing the work he had to do. His belief was that the deceased did not touch the bare spot at all, but a part of the insulation just as it emerged from the porcelain cover.

The Chairman: Which means that the insulation was defective?—Witness said he thought the deceased caught hold of it to steady himself, and the insulation was not strong enough.

In re-examination, Witness said the deceased would not often go into the high-tension room. He would go into it every shift, and if anything were wrong would call witness. The room where the accident took place was the most dangerous in the station. It was not possible, standing on the oil switch on the right, to clean the whole of the bus-bars. Witness would not have stood on the left-hand oil switch. He believed that deceased fully understood the danger of 10,000 volts. He saw the deceased get on to the left side in the previous week, but on that occasion that side was dead.

Mr. G. Scott Ram, H.M. Inspector for the Home Office, said he had to visit electrical stations to see that the regulations were complied with, and he went to the Finchley sub-station after the accident.

Mr. Gray was proceeding to put it to witness to say what provision might have been made in the station to prevent the action, when Mr. Bodkin objected, and pointed out that the question was whether the particular regulations had been contravened or not. These regulations had the force of an Act of Parliament, and it was no part of the duty of a gentleman, however expert, to put his interpretation upon any section.

Mr. Gray: If the isolating switch had been open could this accident have occurred at the place where it did occur?—It could not.

If the isolation switch had been closed and a screen had been placed round the current transformer, could that accident have happened?—No.

Speaking as a practical man, is there any practical difficulty in any of these methods of avoiding accidents?—None whatever.

Mr. Gray: Supposing the isolating switch were on, and there were no screens, is there any other way of rendering the whole of that room dead?—The cable might have been made dead from the far end.

The Chairman: Then that is a third alternative?—Yes. It would be some miles away at the next sub-station.

The Chairman: But that would be impracticable?—It is very often done by telephoning to the other station.

Mr. Gray: That would not have stopped the working?—No; the other feeder could have gone on.

Answering further questions put by Mr. Gray, witness said that, in his opinion, the easiest way to have cleaned the pressure-limit resistance would be first to clean one side, standing on top of the right-hand cell, as Shapcot did, and then it would be the easiest thing to clean from the other side. He did not consider there was any difficulty of a person getting across from one side of the passage to the other. If a person went to the top of the bus-bars to clean, there was nothing to prevent him from coming down on the other side on to the left-hand cell.

Cross-examined by Mr. Bodkin, witness said it was easy to get across from the right-hand series of cells to the left-hand. He admitted it was a distance of at least 2 ft. 6 in., and that a man would have to bend down to make himself 3 ft. 2 in.

Mr. Bodkin: Active official as you are, could you reduce your height to 3 ft. 2 in. and then step across 2 ft. 6 in.?—Witness said that the same questions were put to him at the Police Court, and he gave the opinion that a man could get across. He had been to the station since then, and saw an engineer do it.

Replying to the Chairman, witness said he had not been to this particular station before the accident, but he had been to other stations of the same company. The station was visited by other inspectors. The station had been going on for many years, and he believed it had been inspected.

If this is so, how is it that the Home Office has not pointed out this defect?—It is not the duty of the Home Office to point out all defects. The duty of complying with the regulations is upon the occupier.

How can they say whether the regulations are complied with if they are not aware of the defect?—It is their duty to be aware.

Then why is not this pointed out? I want to be perfectly fair. Here is a Government department supposed to overlook buildings. This has gone on for some years, and then there is an accident, and the Home Office say: "Why is not this done?" If the Home Office officials did their work properly they would have detected this dangerous spot?—It is a regulation dealing with special work and repairs, and extensions. The Home Office official might go to that building once a week and never catch them at this particular cleaning work. This regulation requires that certain things are to be done when you do certain work, but you might go a hundred times and not see that work done.

But the inspector would know when it was cleaned; certain men would have to be in certain positions?—He would know certain things ought to be done when it was cleaned, but it is no matter to the inspector what they do if they make it safe in accordance with the regulations. If the switch had been off everything would have been safe and the regulations would have been complied with, but they did not do that. They chose to have another method, and in choosing that they did not make the proper provision.

How is it that the Home Office, with all this inspection, did not foresee these things, and point out to the officials the chance of a possible accident? You are the expert?—We told them in the regulations that when anything has to be done on the switchboard they shall do either of two things, and they have done neither. It is impossible for the Home Office to send inspectors out to see to these, as they do not know when the work is to be done.

This closed the case for the respondents.

(*To be continued.*)

We shall complete our report of the hearing in our next issue, but the result may now be given.

The Chairman said the Bench were unanimous in their decision. As regarded the conviction under Regulation 18, they were of opinion that the appellants should have opened the switch, which would reduce that point of danger. Therefore, in that case, they thought the appeal must be dismissed, but that the penalty should be reduced to £10 10s. With regard to the conviction under Regulation 28, they were of opinion that within the technical meaning of the regulation Shapcot was an authorised person, and in that case the appeal was allowed. They made no order as to costs.

BUSINESS NOTES.

Electric Clocks at the Ghent Exhibition.—We are informed that among the many interesting things shown at H.M. Post Office exhibit at Ghent Exhibition, which is to be opened this week, is an installation of electric clocks made by the Silent Electric Clock Co., Ltd., of London. In the centre of the Stand is a hanging clock with four faces, while other smaller clocks are placed elsewhere—the whole installation being controlled from one master clock. These clocks are of the standard pattern as supplied to H.M. Post Office, for which department the Silent Co. have carried out, and are now carrying out, many important electric clock installations. The main feature of this company's system lies in the "rotary armature" dial mechanism invented by Mr. G. B. Bowell.

Electric Laundry Irons.—Referring to the letter of "Ironical," in our issue of the 11th inst., Mr. G. Maurice, manager of the fixture and heating departments of the G.E.C., agrees that the writer's remarks would have been fully justified up to quite recently. The General Electric Co., however, has recently placed upon the market a "Magnet" electric laundry iron, which will do away with most of the objections raised by our correspondent to this class of electric-heating apparatus, and to demonstrate the progress made in this class of goods, the company would have much pleasure in submitting to "Ironical" a sample of these "Magnet" laundry irons to test.

Referring to the same correspondence, Messrs. Simplex Conduits, Ltd., inform us that they have supplied a large number of their "Service" type iron. This iron was described in our issue of April 5th, 1912, and is provided with special means of protecting the connector and with a revolving connection box, which takes up any twisting of the connecting wires when the iron is in use, preventing the frequent failures attributable to this cause. They send us an interesting report from the chief engineer of Dundee regarding a number of these irons in use at the laundry attached to the King's Cross Hospital at Dundee, which is worth reproduction, as showing the economy of electric irons:—

Weight of irons in use: Two 8½-lb., one 12-lb.

Date.	*Material Ironed.*	*No. of workers.*
Monday, Feb. 17th, 1913...	21 pieces of flannel; 27 unstarched dresses.	1
Tuesday	40 pieces body linen ...	1
Wednesday...	150 aprons	2
Thursday	Collars, cuffs, belts, ties, caps, small pieces of finery and 130 bibs of aprons.	2
Friday	16 starched dresses and petticoats	1

Units used for week, 42; at 1d. = 3s. 6d.
Coal previously used, 5s. 6d. Net saving for week, 2s.

Date.	*Material Ironed.*	*No. of workers.*
Monday, Feb. 24th, 1913...	24 unstarched dresses ...	1
Tuesday	27 pairs of flannel 38 underclothing	1
Wednesday...	147 aprons	2
Thursday	432 articles	2
Friday	14 starched dresses and small finery	1

Units used for week, 58; at 1d. = 4s. 10d.
Coal previously used, value 6s. 6d. Net saving per week, 1s. 8d.

The workers state that the irons are eminently satisfactory, as, owing to the fact that the irons are always ready, the time taken to do the work in hand is very much lessened; also the comfort, compared with the awful heat experienced before, is unique. The management have since gone in for a glossing iron for the collars and cuffs, which now does away with the old coal stove entirely.

Siemens on Parade.—Messrs. Siemens Bros. Dynamo Works, Ltd., of Dalston, obtained both a first and second prize at the London Van Horse Parade in Regent's Park. As many of our readers are aware, the firm's delivery vans are used for displaying their well-known posters.

New Zealand's Electrical Manufactures.—From the report of the industrial census of New Zealand taken in 1911, which has lately been issued, it appears that the value of the productions of the electrical engineering concerns in the Dominion in that year amounted to £69,673.

Book Notices.—*Chronique Illustrée du Concours International de Télégraphie Pratique.* Turin. 1911. Milan: from the Author. Price 20 fr.—This really magnificent souvenir of the 1911 competitions at Turin, prepared by Sig. F. Geronimi, constitutes a complete record of the organisation, execution, and consummation of of the noteworthy event, which took place during the run of the Exhibition at Turin. Most ample information is given regarding the arrangements that were made, and the volume is replete with photographic illustrations, many of which are very beautiful. A full account is also given of the proceedings at Como in honour of Volta, and of the celebrations at Milan, followed by a chronicle of the closing visit to Rome, and much other matter. Unfortunately, there was only one British competitor on this occasion, so that the results of the trials are of little interest to this country; but the work as a whole will be invaluable when the organisation of a similar international competition is under consideration, and we must express our admiration of the manner in which this volume has been written, illustrated, printed and bound.

"*Proceedings* of the American Institute of Electrical Engineers." Vol. XXXII, No. 4. April, 1913. New York: The Institute. Price $1.00.

"*Transactions* of the Institution of Engineers and Shipbuilders in Scotland." Part VI. 1912-13. Glasgow: The Institution.

"Descrizione una Macchinetta Elettro-Magnetica." By Dr. Antonia Pacinotti. Milan: Associazione Elettrotecnica Italiana.

"*Transactions* of the North-East Coast Institution of Engineers and Shipbuilders." Vol. XXIX, Part 5. April, 1913. Newcastle-on-Tyne: The Institution. Price 5s.

"*Journal* of the Franklin Institute." Vol. CLXXV, No. 4. April, 1913. Philadelphia, Pa.: The Institute. Price 50 cents.

"*Journal* of the Röntgen Society." Vol. IX, No. 35. April, 1913. London: Smith & Ebbs, Ltd. Price 4s. net.

French Electrical Imports.—The value of the dynamo-electric machinery imported into France last year amounted to only £371,920, as compared with £378,640 in 1911. On the other hand, the imports of electrical and electrotechnical apparatus increased in value from £571,200 to £671,600.

Bankruptcy Proceedings.—Samuel Smith (trading as Smith & Sons), 22A, 24 and 26, Victoria Square, Widnes, Lancaster, electrical engineer, &c.—The adjourned public examination of the above-named debtor was held at the Court House, Government Buildings, Victoria Street, Liverpool, last Monday. It was reported that there had been disputes between the debtor and his sons as to the conduct of the business, and a deed of assignment was executed, but later, finding himself in difficulties, debtor filed his petition. There had, in the meantime, been a proposal to convert the business into a company, but the matter had fallen through. The Official Receiver stated that the deed of assignment was executed about seven months before the date of the petition, and that the deed became operative. He (debtor) filed a statement showing an estimated surplus of £750. In regard to the assets the debtor stated that £750 was the surplus if the estate had been realised promptly and properly, but he did not think there would be that amount of surplus now. Under those circumstances, the accounts would have to be amended. Subject to the accounts being amended, the examination was closed.

Liquidations.—The Gilbert Arc Lamp Co., Ltd.—Creditors must send particulars of their debts, &c., to Mr. W. A. Henderson, 3, Fenchurch Street, E.C., the liquidator, by May 18th.

Berry Construction Co., Ltd.—A meeting is called for May 22nd at 29A, Charing Cross Road, W.C., to hear an account of the winding-up from the liquidator, Mr. J. C. Wrist.

Acoustic Patents, Ltd., 353, Oxford Street, London, W.—Date of release of liquidator, April 10th.

Patent Application.—Application has been made for the restoration of Patent No. 22,819 of 1908, granted to Thomas John Murday for "Improvements in Primary Electric Clocks."

Safety Lamp Approved.—The *London Gazette* contains notice of approval by the Home Office, of the Gray-Sussmann electric safety lamps, Nos. 3 and 4, for use in all mines covered by the Coal Mines Act, 1911.

For Sale.—Messrs. P. Huddleston & Co. will, on May 1st, sell by auction, at Dalling Road, Hammersmith, a large quantity of electrical apparatus. See our advertisement pages in this issue.

Trade Announcements.—Arrangements have been completed for the continuance of the old-established business of John Musgrave & Sons, Ltd., by a new company with a cash capital of £80,000, which was duly registered on March 12th. Such new company, in addition to acquiring the assets of the old company, has purchased the goodwill and patterns of the business of Messrs. J. & E. Wood, engineers, of Bolton, and Mr. Henry Wood will act as a director. The name of the new firm is John Musgrave & Sons (1913), Ltd., and its address Globe Ironworks, Bolton. It is stated that the new capital introduced into the concern is ample for its requirements.

Messrs. J. Price & Son, electricians, &c., have opened new premises at 113, Bedford Road, Rock Ferry, near Birkenhead.

Messrs. Marsh, Son & Co., dealers in electrical fittings, are relinquishing their depôt at 11, Upper Priory, Birmingham.

Messrs. H. W. Butler & Co., of Craven House, Kingsway, W.C., have been appointed agents for London and district for Messrs. James MacIntyre & Co., Ltd, of Burslem, makers of electrical porcelain.

Catalogues and Lists.—Messrs. C. E. Lugard & Co., Chester.—Illustrated pamphlet of 28 pages, fully detailing and showing by means of half-tones and line diagrams, the Vulkan drive applied to several makes of planing machines—the Vulkan reversing electro-magnetic clutch and the automatic reversing switch.

Messrs. Siemens Bros. Dynamo Works, Ltd., Tyssen Street, Dalston, N.E.—Eight-page booklet, giving full particulars of their series system of H.C.P. illumination, as at present applied to street lighting by the Brighton Corporation. It is claimed for the Brighton system that low-voltage H.C.P. "Wotan" lamps can be used for replacing series arc lamps, with a considerable reduction in working and maintenance costs. The existing wiring can be employed and the same substitutional resistances.

The Electrical Co., Ltd., Charing Cross Road, W.C.—April stock list of A.C. and C.C. motors, kinematograph sets, &c.

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Messrs. Petters, Ltd., 63, Queen Victoria Street, London, E.C.—New 16-page catalogue, with excellent art coloured pictures, giving description, specification, results of tests, &c., of the Petter patent semi-Diesel crude oil engines.

The General Electric Co., Ltd., 67, Queen Victoria Street, London, E.C.—Publication No. 1,662 (eight pages), containing fully-illustrated particulars and prices of the "Magic" suction cleaner, the "Little Briton," "Rapid," "Express," and "Turbine" vacuum cleaners, and attachments for use with them.

Messrs. Veritys, Ltd., King Street, Covent Garden, London, W.C.—New publication No. 751, contains some illustrated information concerning the "Aston" totally-enclosed and ventilated type motors, ranging from ½ to 80 B.H.P. Tabular particulars are given for such motors for voltages ranging from 110 to 500 volts.

Messrs. Scholey & Co., Ltd., 151, Queen Victoria Street, London, E.C.—Small pocket pamphlet, entitled "The 'Leakage' at your Lift—have you Noticed It?" in which the waste occurring in hydraulic installations is alluded to and the merits of the Graham electric lift are summarised.

LIGHTING and POWER NOTES.

Acton. — The U.D.C. has requested the Metropolitan Electric Supply Co., Ltd., to submit an estimate for the lighting of the public baths, library, and Council offices, and also for supplying electricity for power for the artesian well and other purposes at the public baths.

Argentina.—The Compania Alemana Transatlantica de Electricidad is making active propaganda in connection with the use of articles of domestic use, such as kettles, irons, toasters, heaters, &c., which have not yet to any great extent been adopted in Buenos Ayres.

So as to meet the increased service in Concepcion del Uruguay, the Anglo-Argentine Electricity Co. will shortly commence the construction of a new power house, plans of which have already been approved.—*Review of the River Plate.*

Ayrshire.—Two new pits which have been put down near Dreghorn by Messrs. Wm. Baird & Co., are to be equipped with modern electric plant, including electric motors for winding.

Bingley (near Keighley).—The U.D.C. proposes to erect an electricity sub-station upon a portion of the market site.

Birkenhead. — At a meeting of the T.C., Alderman T. S. Deakin, in presenting the estimates for the year, said the Electricity Committee had come forward with a contribution of £2,000, which was £500 above that included in the estimates for the year 1912-13. In addition to this, the Committee believed that it would be able to increase the renewals fund by over £2,000, which would raise that fund to somewhere about 8 per cent. of the total capital outlay. The Tramways Committee's traffic receipts showed a considerable increase, the figures for 1912-13 being practically £2,000 above those for 1911-12, and some £1,700 in excess of the estimated income. It expected to do even better in this respect during the present year, and to be able at its close to swell the renewals fund by £2,100. This was essential owing to the necessity of providing funds for the renewal of the tracks, which work would probably have to be faced in the near future. At March 31st the fund amounted to not more than £14,000, which was rather less than 4 per cent. of the amount expended on capital account—none too big a reserve when bearing in mind that the undertaking would not be freed from debt for a further 16 years. In the discussion which followed, Mr. D. J. Clarke said that the total capital expenditure of the Electricity Committee was £176,797, and the outstanding debt £131,017; therefore, the Committee had paid back £45,000, and it had a reserve fund of £10,063.

Blackburn.—At a meeting of the Corporation Electricity Committee, on Monday evening, Mr. P. P. Wheelwright, electrical engineer, submitted his scheme for erecting and equipping a new electrical station at Greenbank, at a cost of £75,800. This was adopted after discussion. The new premises are not intended to supersede the present establishment in Jubilee Street, where new machinery has just been installed, but rather to act as an adjunct to it. The demand for power is gradually increasing, owing to its more general adoption for houses and for mills and factories. Mr. Wheelwright says that what is required is an increase in productive power to enable the department to keep ahead of the demands, and not to have to refuse customers in the future. It is true that the present plant is not yet fully loaded up, but it must be borne in mind that a long period after the adoption of a scheme must elapse before the new station can be erected and completed ready to give a supply of energy. The new station is proposed to accommodate about 10,000 KW. of plant.

Bridlington.—A L.G.B. inquiry has been held into the application of the Council to borrow £5,000 for the purposes of the electrical undertaking. The electrical engineer (Mr. A. J. Beckett) stated that the demand for current was greater at the present time than it had ever been in the past, and it was likely that further application would have to be made for another loan for mains and services, amounting to £3,500. The profit made at the works since they were opened was about £2,784, and there was a small reserve fund. The £5,000 included £2,905 for generator; £420 for pipes, &c.; £220 for switchboard; £100 for contingencies; £500 for new pipes and extensions; and £200 for air filter and foundations. The total amount borrowed for the electrical undertaking was £47,125, of which £46,746 had been expended up to March 31st.

Bristol.—To the annual report of the Bristol Chamber of Commerce about to be issued for consideration at the meeting of this organisation on May 22nd, an interesting report is contributed with regard to the Corporation electrical supply. An optimistic tone characterises the statement, in which the following occurs:—

"Progress by the Bristol Electricity Department has been most marked during the year. The net number of new consumers added to the books was 357, being the highest number recorded since the inception of the undertaking, and comparing most favourably with the increase of 62 new consumers in 1911, which year itself was a very good one. The additions to the system in the equivalent of lamps of 30 watts, equalled 51,576, as compared with 22,562 in 1911.

"The most recent and interesting development in connection with the department has been the introduction of electric cooking stoves. The Electricity Department has kept in touch with the modern demands, and is supplying electric stoves as rapidly as they can be obtained from the makers for cash, or on hire-purchase terms. A considerable number has been disposed of in this way, and by advertising, systematic interviewing and public exhibitions the uses of electricity for cooking, and for other domestic purposes, is being kept well before the Bristol consumers and prospective consumers, and the use of electricity for all purposes is steadily advancing in public favour. A special low rate is charged for cooking.

"Power matters have progressed most satisfactorily, and a great confidence in electricity as a source of power has been firmly established in Bristol. The total H.P. connected to the mains at the end of the year exceeded 13,000 B.H.P. The following are some of the trades using electricity for power:—Tobacco, cocoa, printing, leather, confectionery, cloth, joinery, galvanised iron, brewing, paper-making, engineering and cold storage, and during the year there has been added a very large flour mill.

"The results of the introduction of the hire-purchase of installations department have again been most gratifying, a considerable percentage of the increase of consumers being due to the facilities afforded for acquiring installations on deferred payment terms."

Colwyn Bay.—The abstract of accounts of the U.D.C., for the year ended March 31st, 1913, shows that the gross profit on the electricity undertaking was £3,482.

Delabole.—This village is to be lighted by electricity, the old Delabole Slate Co. having promised to supply energy at a cost of about £1 per lamp per annum. In order to carry out the scheme the ratepayers have adopted the Lighting Act.

Doncaster.—In connection with the R.D.C.'s scheme of sewerage works at Askern, the L.G.B. has sanctioned the borrowing of £3,165 and £500, the latter amount being for electric motors and pumps.

The B. of T. has granted the T.C. an order to enable electricity to be supplied by the Corporation within the areas of the Bentley-with-Arksey and Balby-with-Hexthorpe Urban Councils.

Dublin.—An examination of the details of the Public Lighting Committee's estimates discloses the fact that the income estimated for the current year at £95,075 is now expected to reach £95,233, while the Committee has set down as the probable income for the ensuing 12 months the sum of £108,096, which it is confident will be realised. The working expenses have, however, shown an increase from £37,857 to £41,413, practically all of which is accounted for by the increase in the cost of coal of £2,650, and of wages and materials of £840. After providing for interest and repayment of loans, the Committee estimated to have a surplus for the current year of £16,724, which is now expected to realise only £13,326. The surplus, of course, would have approximated more closely to that anticipated when presenting last year's estimate were it not for the increase above referred to. A sum of £3,331 is proposed to be allocated in relief of next year's rates out of this surplus, and, taking this with an amount which the Council resolved last year to transfer, the total sum brought to relief of rates for the current, and the coming, year amounts to £8,831. An alternator has been renewed at an expenditure of £1,500 out of the profits of the current year.

Ealing.—Having further considered the proposals of the Fixed Price Light Co. for the adoption of a scheme for the lighting of small houses, the Electricity Committee of the B.C. has ordered a reply to be sent to the company that, at the present time, it is not prepared to accept the offer.

Edinburgh.—It was reported to the Electric Lighting Committee that the estimate of expenditure in connection with the department for the year 1913-14 is £80,265, as against an estimated expenditure for 1912-13 of £73,470, and an actual expenditure in 1911-12 of £69,640. The estimated revenue is £142,660, as compared with an estimate of £135,410 in 1912-13, and an actual revenue of £131,678 in 1911-12. The sum estimated for cost of coal is £30,000, as against £24,000 last year.

The Electric Lighting Committee has agreed to extend the mains to Cramond, provided the consent of the B. of T., the County Council and the Lothians Power Co. is obtained. The extension will cost about £900. The Corporation mains at present extend to Craigcrook Castle, and it is expected that a number of residents

and proprietors in the Cramond district will take advantage of the further extension.

The Electric Lighting Committee has also approved of the proposal to supply electricity to Redford Barracks direct from the city mains. The cost of the supply will be ½d. per unit more than the rate within the city.

Grimsby.—A L.G.B. inquiry was held on April 16th, into the application of the T.C., for loans of £9,300 for new plant for the electric light works, and £8,000 for mains and services. The inspector, Mr. T. C. Ekin, suggested that a sum of £6,000 in the sinking fund, which accumulated during the first three years of the undertaking before a regular loan was taken up, should be utilised in respect of the present application. In consequence, the Council revised the application to £9,300, made up as under:—Turbine and condensing plant, £7,500; switchboard and cables, £300; pipework, £600; foundations, £250; additional feeder panel, £100; extension of cooling towers, £200; oil separator, £150; contingencies, £200.

Harwich. — Efforts are being made to form a local electric light and power company, for the purpose of supplying "cheap electricity" to the district.

Hazel Grove.—The B. of T. has issued a prov. order to the Hazel Grove and Bramhall U.D.C., authorising it to supply electrical energy for public and private purposes in the urban district.

Higham Ferrers.—Electrical mains are about to be laid in the town, the company holding the Order having informed the T.C. that it will forthwith commence the laying of mains in the High Street.

Hoylake.—The U.D.C. has had under consideration a report by the electrical engineer, recommending the following extensions as capital expenditure:—400-KW. set and condensing plant: engine, £1,750; alternator and exciter, £800; panel and rheostat, £110; piping and valves, £200; condenser, £1,830, and other items, totalling £5,500. The Council approved of the scheme, and decided, subject to the approval of the L.G.B., that the extensions be proceeded with. It was also decided to advertise for tenders for a triple-expansion Belliss engine coupled to a 400-KW. alternator, and a committee was appointed to consider the tenders and report thereon.

Hyde.—The Corporation had decided to ask the Joint Electricity Board to submit to the Street Lighting Committee a scheme for lighting Newton Street, Old Road and Bennett Street by electricity, together with an estimate of the cost.

India.—According to the *Indian Textile Journal*, arrangements are being made with a view of largely increasing the power available at the Cauvery Falls during the dry months of the year and rendering it secure from interruptions on account of shortage of water. The scheme also embraces extensive irrigation works.

Japan.—A correspondent says that the development of hydro-electric stations for supplying Tokio and district with power, has been making great headway. There are plants with a total capacity of about 225,000 KW. starting up, under construction, and projected for this purpose. The transmission pressure is generally 66,000 volts, the transmission lines being equipped with steel towers for distances of 60 or 70 miles. The Sagami Water Power Co. is just placing orders for 12,000 KW. of plant for two power houses, for the supply of power in Yokohama. The transmission will cover 45 miles, and be at 66,000 volts pressure.

At the annual meeting of the Yokohama Foreign Board of Trade just held in Yokohama, the chairman referred to the great development in hydro-electric companies in Japan, stating that the total subscribed capital of such companies exceeded £25,000 000. A large number of the concerns have not yet reached the dividend-paying stage, but there can be no doubt that the cheap power they will be able to offer to industrial concerns will in due course prove a great asset to the country and a stimulus to many industries struggling against the handicap of dear fuel. He added that although Japan may not have much coal there is an ample rainfall, and, fortunately, also suitable physical configuration, which will make it possible for consumers to be supplied with all the water and electrical power they require at a moderate cost.

Another correspondent says a period of severe competition for the electric lighting business in Tokio is about to be inaugurated, for as a result of the announcement that the Katsuragawa Electric Co. will be ready to supply current about the middle of May, the Nippon (Dento Karsta) Electric Light Co. is making every effort to have its plant ready by the end of the present month. The last-named concern proposes to only supply the two districts of Shitaya and Asakusa at first, and with the view of securing clients has decided to install 30,000 10-C.P. lights free of charge for several months.

Kilmarnock.—The T.C. has approved of a scheme for providing electrical installations in dwelling houses up to a rent of £20, free of cost, the charge for energy to be 5d. per unit, with a minimum of £1 5s. per annum. The approval of the scheme, however, has been given on the understanding that the scheme may be dropped, if, after experiment, it is found not to pay.

Leatherhead.—The Leatherhead and District Electricity Co., Ltd., has recently extended its sphere of operations in certain parishes under the parochial control of the Epsom Rural District Council. We understand from Mr. Leslie Dixon, the manager, that the company has obtained powers to supply in the parishes of Bookham, Effingham, Cobham and Stoke D'Abernon, and has laid seven miles of three-phase high-tension mains for supplying light and power in these parishes. A supply to the first two parishes mentioned will be given almost immediately as the new plant is practically ready. Cables are now being laid to Cobham, where a supply will be available, when the mains are completed, in the course of a few months.

Lincoln.—An inquiry has been held by the L.G.B. relative to the Council's application for sanction to borrow money for local purposes. It was stated that £12,500 was required for extensions at the electricity works, information as to the proposals being supplied by Mr. S. Clegg, the Corporation electrical engineer.

London.—LEWISHAM.—The chairman of the B. of G., discussing the question of electric lighting in the Infirmary, said, with regard to their engineer, he did not think anybody knew he was acting against any rules of any association. It was thought at one time that the prices for installing the electric light might be prohibitive, but now they found that the cost was not likely to be so great as they estimated. He added that he had received a letter from a churchwarden of a Lewisham church, in which it was stated that the cost of lighting the church with gas for the quarter ending Christmas, 1911, was £9 10s. 1d., and Lady Day, 1912, £9 19s. 1d. The cost of lighting the church by electricity for the Christmas quarter, 1912, was £4 12s. 9d, and for the Lady Day quarter, 1913, £2 14s. They were paying 4½d. per unit, whilst the Guardians would only pay 2d. per unit for lighting and 1½d. for power.

MARYLEBONE.—As from the June meter meetings, the non-contract tariff for heating is to be reduced to 1d. per unit flat-rate, and for cooking to 1d. per unit for the winter six months, and ¾d. for the summer six months. The general manager is of opinion that this reduction will do away with the 2d. and 1d. maximum demand system. Mr. A. C. Roberts, district auditor, in his report upon the audit of the accounts of the Council for the year ended March 31st last, stated that exception had been taken to two classes of expenditure in connection with advertising the undertaking, viz., £81 for labour and materials upon private fitting work, where no charge was made to the customer, and which arose in cases where the work had been done on approval and the customer had elected not to purchase the fitting installed; and £101, the purchase of exhibition tickets for free distribution to persons who might possibly become purchasers of fittings or consumers of current; and the contribution to the expenses of one exhibition. Neither of these expenditures, the auditor concludes, appears to come within any powers which the Council possess, but both items on this occasion had been covered by special sanctions under the Local Authorities (Expenses) Act, 1887. An agreement has been entered into with Marshall & Snelgrove for a stand-by supply. This agreement provides for 60 KW. at £2 per annum per KW., and a further charge of 1d. per unit, except during peak hours (during peak hours 6d. per unit); the minimum amount to be received from 1d. units consumed per annum to be not less than £62 10s. (equivalent to 15,000 units); the firm to undertake not to renew any of its existing plant; and the emergency supply to be used only during peak hours in case of breakdown to its existing plant and while it is under repair.

WESTMINSTER.—The Westminster E.S. Corporation has agreed to a six months' extension of the period of negotiation with the City Council in regard to public lighting in St. George, Hanover Square.

BATTERSEA.—The B.C. is appealing against the decision of Judge Joyce not to grant the Council an interim injunction against the County of London Co., in respect of the laying of trunk mains through the borough.

The Special Committee on London Electricity Supply, appointed in February, 1912, by the L.C.C., states that it has concluded the preliminary steps of its investigation, which included numerous conferences with the various electricity suppliers in London, and has collected a large amount of information. It now proposes to hear expert evidence on the matter, and will be glad to have the views of authorities on either the technical or business side of the matter placed before it.

Long Eaton.—The U.D.C. has authorised the engineer to proceed with the extension of the electricity plant at an estimated cost of £10,000.

Manchester.—The Electricity Committee reports that, notwithstanding the increased cost of coal and materials during the past year, an even rate of progress was more than maintained. During the past 12 months 104,000,000 units were sold, as compared with 93,000,000 units for the previous year. In considering the estimates, the Committee allocated £28,500 to the relief of the rates.

Mansfield.—For the ensuing year the Electricity Committee will make a contribution of £600 from profits towards the general district rate.

The T.C. has accepted the tender of Messrs. J. Maude & Co. for the provision of electric standards for public lighting in the Mansfield Woodhouse district. The Mansfield Woodhouse U.D.C. has accepted the Mansfield T.C.'s terms for the lighting of the streets, and the L.G.B. has sanctioned the T.C.'s application for the borrowing of £230 for that purpose.

Mexborough.—The U.D.C. has resolved that application be made to the L.G.B. for sanction to borrow a further £1,000 in addition to the sum of £10,500 for extensions at the electricity works.

Moffat.—The T.C. has agreed to accept the offer of Mr. W. E. Townsend, of Edinburgh, to submit the necessary detailed plans and specifications, and give a complete estimate of the cost, free of charge, for a scheme of electric lighting, on the understanding that if the scheme goes on he is appointed engineer to carry it out. It is believed that in the Well Burn there will be ample water power to provide a sufficient supply of electricity for the burgh.

Oldham.—A statement has just been compiled by the engineer showing that the Corporation obtained Parliamentary powers in 1892 to supply electrical energy within the borough. The Greenhill station was opened in June, 1903, with plant of 6,000 H.P., which together with that transferred from the old station made the total capacity 6,720 H.P. In 1911-12, a further extension was found to be necessary, and a steam turbine of 2,000 H.P. was installed. During the last two years the demand had increased greatly for power purposes, and rose from 583,553 units in 1910-11 to 888,840 units in the year ended March 25th, 1912. The number of consumers now connected to the mains is upwards of 1,700. In 1911-12 the number of units sold was £5,992,476. The capital expended up to March, 1912, was £306,746, of which £100,000 had been repaid or was in hand.

Philippines.—A Manila paper says the favourable report of the expert who has just completed his investigations of a site for a hydro-electric plant near Pagsanjan is at hand, and as a result the Manila Electric Railroad and Light Co. will invest the sum of P. 3,000,000 approximately, for the purpose of securing cheaper electricity for Manila and the suburban lines. The proposed site on the Caliraya River is distant about 60 miles from Manila. The construction will consist of a dam and runway with an outlet turning the water back into the river again. The initial unit installed will provide at least 33 per cent. more power than is now necessary to supply light and power for Manila, or 10,000 E.H.P., with an efficiency in Manila of about 80 per cent.

Rishton.—In regard to the objection of the District Council to the application of the Accrington Corporation for permission to supply electricity to the paper mills of Messrs. A. M. Peebles & Son, Ltd., the Rishton Council appointed a deputation to confer with the town clerk of Accrington.

At a meeting of the Rishton Council on April 17th, it was decided to consent to the application by the Corporation to the B. of T. for an order authorising the Corporation to supply electricity to Messrs. Peebles' mills, subject to certain reservations and conditions.

Rochdale.—The profit on the electricity works for the year is £2,883. With the exception of 1911-12 this is the lowest since the department began to pay, and is attributed to increased cost of coal, and to additional interest and sinking fund charges on extensions, the full benefit of which cannot yet be felt. The gross profit on the year was £11,740, as against £10,664 a year ago. Of the net profit of £2,883, £2,000 is being allocated to the relief of the rates and the balance carried to reserve.

The Electricity Committee has agreed to supply current in bulk to Whitworth for five years on terms mutually arranged.

Romford.—The U.D.C. has sealed an agreement with the County of London Electric Supply Co., and given consent to the prov. order being granted to the company, subject to the insertion of a purchase clause.

St. Thomas.—The Westindische Compagnie, of Copenhagen, having bought the "French Wharf" in the Danish Island of St. Thomas, have decided to undertake works for the modernisation of the harbour, including the building of quays, the installation of electric cranes, the construction of a power house, &c. For particulars of the machinery requirements, application should be made to the company.

Salford.—The General Electric Co. have offered to supply the Electricity Committee with flame arc lamps on loan free of charge for experimental purposes. The offer has been accepted, and the lamps are to be tested in Chapel Street.

Skelton and Brotton.—The B. of T. has granted the application of the U.D.C. for a prov. order for electric lighting.

South Africa.—The ratepayers have approved of a scheme for the supply of electric power for lighting Umtata, estimated to cost £7,000. The Municipal Council will borrow the necessary funds from the money in hand for the water scheme. Power will be generated at Umtata Falls, one mile from the town.

Stockport.—On April 16th, Mr. R. H. Hooper, L.G.B. inspector, conducted an inquiry into the application of the Corporation for sanction to borrow £24,500, for the purposes of the electricity undertaking. There was no opposition.

Swansea.—The Housing Committee has asked the Tramways and Electricity Committee to submit an estimate of the cost per week to be charged upon the houses which are to be erected at Town Hill, for electric lighting, such costs to be added to, and included in, the rent of the houses. Application is to be made to the L.G.B. for sanction to borrow £40,000 to cover the cost of extending the generating plant and the construction of sub-stations, mains, cables, &c.

Swinton (Lancs.).—The Tramways and Electricity Committee has instructed the Clerk to point out to the L.G.B., that the expenditure on the supply of electricity to Broad Oak Park would be greater than the amount sanctioned to be borrowed (£600), and to ask if the Board would allow the work to be proceeded with—application for sanction to borrow a further sum being made later.

At the D.C. meeting last week, Mr. Heywood, referring to the electricity undertaking, said there were now 167 consumers, and the units sold were 206,339 and the receipts £1,728, as against 159,182 units and £1,433 for the previous year. The total loans borrowed for the undertaking were £13,910, the repayments up to the present being £1,434. The capital expenditure had been £12,892, and the loans unspent £1,018. The Broad Oak Park extension was now taking practical shape, after several years of hesitation on the part of the Council. The deficit for the past year was £238, but the expenditure was coming down, and there were prospects of having a balance in hand before long.

Yeovil.—The T.C. is having a report prepared with regard to the relative cost of electricity and gas for driving the machinery of the sewage works.

York.—At the last meeting of the City Council, it was reported that the L.G.B. had given sanction to the borrowing of £500 for the wiring of premises for electric lighting as desired by the Council, the period of repayment being fixed at 10 years. The following tenders were recommended for acceptance:—Two water-tube boilers, with superheaters, chain-grate stokers, pipework, &c., Messrs. Babcock & Wilcox, Ltd., London, £4,213; supply and erection of a turbo-alternator of a capacity of 3,500 KW, 3,000 R.P.M., condensing plant, &c., the Oerlikon Co., of Zurich, Switzerland, £9,967; storage battery and reversible booster, &c., and the maintenance thereof for a term of 15 years, the Tudor Accumulator Co., Ltd., £3,899, with a maintenance charge of £188 per annum. In answer to a question addressed to him, Alderman Meyer stated that the approximate cost of laying cables in the streets of the city generally for street lighting, domestic lighting and other domestic purposes would be £16,500 for 30 miles of streets. The cost of the feeders, distributors, &c., would be £119,000 if carried out on the underground system, but if powers could be obtained to carry it out in another manner the cost would be reduced to £71,108. So far as regarded street lighting, he would recommend the Council to consider some scheme for undertaking this. Alderman Wragge expressed the opinion that if it was only going to cost the city £16,500 to light the whole of the streets, it was time the work was undertaken. If that sum was spread over a period of 40 years at 3½ per cent., the interest and sinking fund would be £825. The supply of electricity from the Council's own works would cost £2,250, the two sums together totalling £3,075, whereas the gas company was now receiving £4,600 for lighting the streets by gas. Besides that, they would be able to make a substantial profit, and the saving which would be made would amount to a 1½d. rate. The recommendations of the Committee were adopted, including the proposal to light the streets by electricity, as outlined by Alderman Meyer and Alderman Wragge.

TRAMWAY and RAILWAY NOTES.

Birmingham.—A special meeting of the City Tramways Committee was held on the 15th inst. for the purpose of hearing the views of a deputation from the Diocesan Conference, which had passed a resolution recommending that no cars should be run on Sundays, in order that all employés might have an opportunity of attending Divine worship. The Committee, after hearing the deputation, expressed sympathy with the object in view, but explained that the public convenience had to be considered, and many difficulties were likely to present themselves. It was agreed, however, to refer the whole matter to Mr. A. Baker, the general manager, who was instructed to consider the points raised and report to the next meeting whether anything could be done to meet the views expressed by the deputation.

Blackburn.—The general manager of the tramways (Mr. J. H. Cowell) states that the gross receipts for the past year were £66,683, against £63,129 in the previous year; working expenses £42,516, against £41,235; gross balance £24,166, against £21,894. The net profit was £3,870, comparing with £1,290 in the previous year. The traffic details show an increase of 17,150 miles, 556,452 passengers, and £3,174 in receipts. From parcel carrying the revenue was £2,194, against £1,995; 276,715 parcels were handled during the year.

Bury.—The profit on the tramway sections for the past year was £9,572, of which £5,000 is to go to rate relief purposes, £1,000 to insurance fund account, and the balance to reserve and depreciation fund account.

The experimental service *viâ* Heywood Street is to be continued for another month.

Doncaster.—At a meeting of the Finance Committee, the estimate of the Electricity and Tramways Committee for six new tramcars, with covered tops, at an estimated cost of £800 each, was approved of. The purchase of additional cars is necessitated by the growth of the tramway traffic generally.

Elland.—The U.D.C. has decided to suggest to the Huddersfield Corporation the dropping of the proposed extension of

the tramways from Elland Town Hall to West Vale, owing to the decision of the Greetland D.C. not to consider the question further until the Huddersfield Parliamentary Bill has become law.

Heywood.—At a meeting of the Electricity and Tramways Committee on April 16th, it was reported that there was a loss of £810 on the tramways undertaking during the past year's working, and a loss of £4,118 on the electricity undertaking. These losses are equal to a rate of 10d. in the £. For the previous year the losses were £742 on the tramways, and £2,532 on the electricity undertaking.

Huddersfield.—The borough treasurer's financial statement respecting the tramways for the 12 months ended March 31st, 1913, showed a capital outlay to date of £417,408. The miles run were 2,383,858, compared with 2,245,427. The income amounted to £109,709, or 11·04d. per car-mile, against £104,602, or 11·18d. last year. The income was made up as follows :—Passengers, £106,286 ; postmen, £300 ; parcels, £1,238 ; advertising, £1,200 ; coal haulage, £676 ; and sundries, £9. The total working expenditure was £65,528, or 6·59d. per car-mile, compared with £57,239, or 6·12d. last year, leaving a gross surplus of £44,181, against £47,363. Interest on capital absorbed £13,318, and redemption of debt £10,904, and after provision had been made for depreciation at 3 per cent., there was a net surplus of £7,437, or ·75d. per car-mile, against £11,765, or 1·52d. last year. The balance brought forward on the reserve or renewals account amounted to £13,253, the interest on investment was £350, and the transfer for the 12 months £12,522. The payments amounted to £7,841, leaving a fund of £18,284. The Committee has decided that £6,590 be transferred to the borough fund in relief of the borough rate, and that the balance of £847 be placed to the reserve or renewals fund, making the total amount in that fund £19,131.

The urban districts of Holmfirth, Kirkburton, Lepton and Mirfield are to be linked up with the Huddersfield tramways by means of motor-omnibus services.

Japan.—In connection with the electric railway between Yokohama and Tokio, the electrical track is now being laid alongside of the existing steam road ; the 10,000-H.P. gas-engine station for supplying this line is also being equipped—the engines were illustrated recently in our pages.

Leeds.—The balance-sheet of the tramway undertaking issued on Monday shows that after providing for every form of expenditure there remains a sum of £61,374 to be used for the relief of the rates—an increase of £211 over the corresponding figure of last year. This is nearly equal to the produce of a 7d. rate. The total revenue of the undertaking amounted to £411,531 (or 11·229d. per car-mile), an increase of £16,210. The increased number of passengers carried was 3,646,242. Traffic receipts amounted to £405,551 (11·120d. per car-mile) against £391,142 (11·008d.). Advertisements on cars realised £3,661. Traffic expenses amounted to £109,413, wages of drivers and conductors being £77,442—an increase of £3,881. General expenses were £36,005, an increase of over £4,000. Regarding £19,809 set aside for rates and taxes, £5,300 of this is being held over pending the decision of the House of Lords on the tramway rating case. If the appeal is dismissed the profits will benefit to the extent of the sum now held over. The total working expenses were £213,817, leaving a balance of £197,713 to be carried to the net revenue account, which, with bank interest, &c., amounts to £205,224. Out of this has been paid £42,196 for interest on capital ; £5,020 income-tax, and £3,216 as rent for the Morley lines, leaving £154,790 to go to the appropriation account. £49,922 had to go to the sinking fund, and £41,752 for renewing the permanent way—a record figure—£4,439 increase on the previous year. Other items brought the total expenditure of the account to £93,415, which, deducted from the available surplus of £154,790, left a net surplus of £61,374 odd. The estimate of the department in this respect was £60,000.

London.—The L.C.C. has circularised all the Metropolitan B.C.'s requiring them forthwith to send to the Assessment Committee a provisional valuation list containing the assessment of the County Council's tramways, on the ground that the hereditament has been reduced in value, in consequence of the falling off of the receipts from the tramway undertaking due (among other things) to competition from motor-omnibuses.

Merthyr Tydfil.—The T.C. has entered into an agreement with the Merthyr Electric Traction and Lighting Co., whereby the time of purchasing the undertaking by the Corporation is extended until 1934.

Plymouth.—A return submitted by the general manager of the tramways for the financial year ended March 31st shows that the cars travelled 820,406 miles, and carried 8,834,786 passengers. Including £1,985 received from the Plymouth, Stonehouse and Devonport Tramway Co., the total receipts amounted to £40,208, an increase of £263 compared with the previous year. All the sections showed an increase in receipts, the highest, however, being on the Peverell route. The total expenditure amounted to £37,370, an increase of £820. For the previous year the figures were :—Miles travelled, 809,036 ; passengers carried, 8,666,269 ; receipts, £39,079 ; and expenditure, £36,550.

Preston.—The Tramways Committee has decided that a new crossing be constructed between Derby Street and Pole Street ; it is also proposed to purchase three additional top-deck covers, at an estimated cost of £360.

Radcliffe. — At a meeting of the U.D.C., it was reported that there was a net profit of £1,411 on the working of the tramways for the past year, which was double that of the previous year.

Rochdale. — The net profit on the tramways undertaking is £7,423, as compared with £6,480 last year. For the first time the undertaking contributes to rate relief. The Committee proposes to offer £2,327 for this purpose, and asks to be allowed to carry £5,096 to the renewals fund, which the members feel requires strengthening in view of the coming necessity for renewal of track.

St. Mellon's.—The U.D.C. on April 16th decided to oppose the Western Valleys Railless Electric Traction Bill.

U.S.A.—After three years of complex negotiations and heated controversy, the contracts for the operation of the dual rapid-transit system for New York city were signed on March 19th. These contracts relate to the operation of a system the total cost of which will be about $400,000,000. Of this, one-fourth covers the existing systems and $300,000,000 the construction now under way or authorised for the new subway, elevated and surface lines. When the new system is placed in operation, which will probably be in 1917, there will be over 600 miles of single track in service, as compared with 271 at present.—*Electrical World.*

York.—The City Council has agreed to the suggestion of the Electricity and Tramways Committee that blind persons should be permitted to ride on the tramcars free of charge.

TELEGRAPH and TELEPHONE NOTES.

Brazil.—Particulars have been published regarding the organisation of wireless telegraphy throughout Brazil. The scheme will embrace an international service of wireless telegraphy both terrestrial and trans-oceanic, a river service, a frontier service and an inter-State service. The international stations will include one at Belem, having a range of 4,000 miles, one at Cape Santa Martha having a similar range, and another at Rio de Janeiro have a range of 2,000 miles. The text of the decree may be seen at the Commercial Intelligence Branch of the Board of Trade.—*B. of T. Journal.*

Chile.—Official sanction has been accorded to the scheme for organising a wireless service in Chile, consisting of a long-distance chain from Africa to Punta Arenas and a low-power chain between Arenas and Talcahuano.

Constantinople.—The *Journal of the British Chamber of Commerce* of Turkey states that the progress of the telephone construction has been delayed by the impossibility of getting the necessary cables and ducts from Great Britain, these being contraband of war. Nevertheless over 26 km. of cable has been laid, and practically all the underground piping is in place. The work of erecting poles in the outlying districts is now in progress, and the three principal exchange buildings are well advanced. Over 3,000 subscribers have been enrolled.

Imperial Wireless System.—On Wednesday last week the Select Committee on the Marconi contract resumed the examination of Mr. Godfrey Isaacs regarding the transactions in shares of the American Marconi Co. The witness stated that the price paid by the English Co. for the shares of the United Wireless Co. was $750,000 ; they were sold, with other property, to the American Marconi Co. for $1,400,000. A letter was read from Sir Henry Norman stating that he had never in any way been connected with the Poulsen people.

On Thursday the examination of Mr Godfrey Isaacs was concluded. He stated that he had personally made no profit in connection with the purchase and sale of American shares, and that the American Co. had no interest at all in the British Co. He believed the foreign Governments with which he had been in negotiation when the Committee was appointed were now awaiting the report of the Technical Committee. The delay had not affected the American Co. Mr. Harry Isaacs was then called, and explained the transactions with his brothers, Sir Rufus Isaacs and Mr. Godfrey Isaacs. Afterwards Mr. Ernest Hawkins was examined regarding the letter which he had written to Mr. Godfrey Isaacs, and the information he had received from Mr. Charles Kerr, who also gave evidence. Mr. Kerr stated that on May 9th, 1910, he formed the Poulsen Wireless Telegraphy Syndicate, Ltd., and held an option on the Poulsen patents, which expired in February, 1911. The option was not exercised, and the syndicate went into voluntary liquidation on June 28th, 1911. Mr. A. A. Campbell Swinton reported to him on the Poulsen system. Since the expiration of the option he had had no interest whatever in the Poulsen system, but he still thought it the better system.

On Monday Sir A. H. Brown gave evidence, and the examination of Mr. Kerr was concluded. Mr. Harcourt Rose, a member of the firm of solicitors that acted for the Poulsen Co., referred to the evidence of Mr. Godfrey Isaacs regarding the origin of the rumours, which he contradicted in detail, stating that the promoters of the Poulsen system were in no way associated with the allegations against Ministers. Evidence was given by stockbrokers regarding the market in American Marconi shares on

April 17th, 1912, the latter stating that the price on April 19th was artificial and absurd, and that the public rushed in recklessly. The Committee adjourned till Wednesday.

Telephone Electrical Staff.—In reply to a question regarding the case of the electrical staff transferred from the National Telephone Co., the Postmaster-General said he found that owing to the arrested development of the telephone system during the latter part of the company's existence, the average length of service of the electrical staff was very high. Under the arrangements sanctioned by the Treasury, it was only possible to place a certain proportion of this staff on the establishment; a number of men with long service had consequently to be assigned to an unestablished class, and complaints were made to him on their behalf. He had now secured the assent of the Treasury to the creation of a considerable number of additional established posts for the benefit of this staff, as a temporary measure; and also to the grant to those members of the electrical staff (other than faultsmen) who did not secure establishment, of a special allowance of 1s. per week, to cease on establishment, by way of compensation for certain privileges which were granted by the company on a higher scale than that which prevailed in the Post Office.

Wireless and the Aurora.—It is stated that during the occurrence of strong auroræ boreales it is almost impossible for the wireless station on Spitzbergen to communicate with the station at Ingo, near Hammerfest. This fact seems to confirm the theory that the aurora is an electrical phenomenon.—*E.T.Z.*

CONTRACTS OPEN and CLOSED.

OPEN.

Australia.—May 14th. Generating plant for Darwin Radiotelegraph Station, Northern Territory. See "Official Notices" April 11th.

Victoria.—May 30th. High-tension switchgear with remote control, for the Melbourne City Council. See "Official Notices" March 28th.

April 29th.—20,000 yd. of 3-in. fibre conduit, for the Melbourne City Council. See "Official Notices" April 11th.

June 11th.—Switchgear and instruments, for the Melbourne City Council. See "Official Notices" to-day.

June 10th. Deputy-Postmaster-General, Melbourne. Incandescent electric lamps.—July 8th. Common-battery switchboard at Windsor.—*Australian Mining Standard.*

New South Wales.—May 12th. Fibre conduit for the Sydney City Council. May 26th.—Meters and glazed stoneware bridges. July 7th.—Arc lamp carbons. Specifications 10s. 6d. for each section, from City Electrical Engineer's Department.—*Australian Mining Standard.*

Tasmania.—June 9th. Telegraph and telephone material for the P.M.G.'s Department. See "Official Notices" to-day.

Queensland.—May 21st. Copper wire and accessories, for the P.M.G.'s Department. See "Official Notices" April 11th.

August 27th.—Five sections of common-battery multiple switchboard, for the P.M.G.'s Department. See "Official Notices" to-day.

W. Australia (P.M.G.'s Department).—July 9th and 16th. Wire.—July 30th. Switchboard cable.—July 30th. Steel towers, battery material, &c.—August 6th. Insulators, telegraph and telephone material and poles.—*Australian Mining Standard.*

Barnes.—May 19th. Feeder and distributor cables, for the U.D.C. See "Official Notices" to-day.

Barrow-in-Furness.—May 7th. Electric light installation at the workhouse, for the B.G. See "Official Notices" to-day.

Belfast.—May 19th. Circulating-water pump, for the Corporation Tramways and Electricity Committee. See "Official Notices" to-day.

Bolton.—April 28th. Reservoir construction in connection with the new Back-o'-th'-Bank generating station. Mr. A. A. Day, Borough Electrical Engineer.

Bootle.—May 13th. Boiler and pipe coverings for Marsh Lane electricity works. Borough Electrical Engineer's Office, Pine Grove.

Canada.—Winnipeg.—May 15th. City Light and Power Department. Two three-phase generators of 5,000 kw. for direct connection to 6,800-h.p. water turbines; also spare parts. Chairman, Board of Control. Deposit, £205. Particulars, Board of Trade Com. Intel. Department in London.

Chesterfield.—The T.C. is to obtain tenders for an overhead electric light cable for Chatsworth Road, and for an installation of batteries and extension of the sub-station at Whittington Moor.

Dublin.—May 1st. E.H.P. sub-station switchboard and accessories and alteration to existing E.H.P. switchboard, for the Corporation. See "Official Notices" to-day.

Felixstowe and Walton.—May 5th. One 150-kw. Diesel-driven D.C. generating set for the U.D.C. See "Official Notices" April 18th.

Glasgow.—May 9th. Cables, meters and arc lamp carbons for a year, for the Corporation. See "Official Notices" to-day.

May 26th.—Two steam turbo-alternators, with condensing plant (5,000 kw. and 2,000 kw. respectively), for the Corporation Tramways Department. See "Official Notices" to-day.

Hoylake and West Kirby.—May 5th. One 400-kw. alternator and triple-expansion Belliss engine, and evaporative condensing plant, for the U.D.C. See "Official Notices" April 18th.

Italy.—Mesagne.—Tenders are about to be invited for the establishment of an electric light installation. Particulars of the Giunta Provinciale Amministrativa.

King's Lynn.—May 5th. One 400-kw. steam dynamo with condensing plant and pipework, for the Corporation. See "Official Notices" April 18th.

London.—Royal Mint.—April 25th. 120 tons of ingot copper. See "Official Notices" to-day.

L.C.C.—May 6th. 3,200 tons B.S.S. steel girder tramway track rails and fastenings; (2) 2,100 tons of special section ditto; and (3) 1,400 tons slot rails and conductor tees. Specifications and forms of tender, £2 each section, returnable, from Mr. G. W. Humphreys, Chief Engineer, County Hall, Spring Gardens, S.W.

May 7th and 9th.—Electrical installations at (*a*) Elthorne Road Special School, Holloway, and (*b*) Wilton Road Central Elementary School, Hackney. See "Official Notices" to-day.

May 13th.—One 20-ton overhead band crane, for the Shoreditch sub-station. See "Official Notices" to-day.

The Highways Committee is to invite tenders from selected firms for two hydraulic accumulators and a pump for the third section of the central car repair depôt.

Mexborough.—May 30th. Lancashire boiler, for the U.D.C. electricity department. See "Official Notices" to-day.

Newport.—April 26th. One 2,000-2,500-kw. steam turbo-alternator, surface condensing plant, one 600-kw. D.C. generator, and E.H.T. and L.T. switchgear, for the Corporation. See "Official Notices" April 11th.

Norway.—April 29th. Christiania Electric Works. Condensing plant for two 6,000-kw. steam turbines. Also two electrically-driven centrifugal pumps, to be tendered for by May 8th. A copy of the conditions has now been received from H.M. Consul at Christiania, and can be seen at the Board of Trade Commercial Intelligence Department, in London. "Elektricitetsverkets Expeditionskontor, Raadhusgaten 19," Christiania. Local representation by a resident agent is essential.

May 1st.—Narvick Electrical Works. 200 metres of 600-mm. turbine pipes with intake machinery, 260-h.p. turbo-generator, two transformers, H.T. cables, &c. Specification, &c., from Dipl. Ingeniör Per Larssen, Hamar, Norway.

Panama.—The National Assembly has passed a law authorising the carrying-out of public works in various parts of the country. The works include the construction of electric lighting installations, telegraph and telephone lines, &c. A list of the works to be carried out may be seen at the Commercial Intelligence Branch of the Board of Trade.—*Board of Trade Journal.*

Peterborough.—May 6th. One 500-kw. D.C. steam turbine generating set and two steam boilers, for the Corporation. See "Official Notices" to-day.

Rochdale.—May 14th. Electrically-driven induced-draught plant, for the Corporation electricity department. See "Official Notices" to-day.

Salford.—May 19th. Tenders invited for 10 car bodies and 10 Brill trucks. General Manager, 32, Blackfriars Street, Salford.

Sheffield.—May 5th. Excavations, retaining walls and extension to water service reservoir at Neepsend Power Station, including valves, pipework, &c., for the Corporation. See "Official Notices" April 18th.

South Africa.—Durban.—May 28th. Electric meter-testing equipment, for the Council. Copy of specification, &c., may be seen at Board of Trade Com. Intel. Dept. in London.

South Shields.—May 1st. Tramway stores for one or three years, for the T.C. Mr. W. T. Robson, manager, Dean Road.

Spain.—June 16th. "Dirección General de Obras Públicas, Ministerio de Fomento," Madrid. Concession for the construction and working of an electric tramway from Reus to Tarragona. Deposit of 10,427 pesetas (about £385) to qualify. Local representation necessary. Particulars at the Commercial Intelligence Branch of the Board of Trade, London, E.C.

Warrington.—May 13th. Traction battery and reversible booster, for the Corporation. See "Official Notices" to-day.

Advertising on Corporation tramcars. Tramways manager, Car sheds, Warrington.

CLOSED.

Admiralty.—Messrs. Carels Frères (Associates of Consolidated Diesel Engine Manufacturers, Ltd.) have received an order from the British Admiralty for two reversible Diesel marine engines of 1,500 B.H.P. each. These engines will be of the two-stroke open marine type, fitted with crossheads, and of Messrs. Carels's latest design.

Australia.—Melbourne.—According to *Tenders* (*Mining and Engineering Review*), a contract has been placed by the City Council with Messrs. Willans & Robinson for two turbo-generator sets, each of 4,000 kw. The turbines are of the Willans standard disk-and-drum type. The alternators are by Siemens, and are for 6,000 volts, 50 cycles, three-phase. The condensing plant is of the Willans standard augmentor type. The plant is to be erected at the Spencer Street power house.

The same exchange states that the Australian Metal Co., Ltd., have secured an order for the following plant, to be installed at the Bellbird Colliery, Hetton (N.S.W.):—

Two Browett-Lindley engines, direct-coupled to two A.E.G. 256-kw. alternators, 2,200-volt, three-phase, 50 cycles, 375 R.P.M.; one eight-panel switchboard, with one Tirrell regulator panel; one 250-kw. A.E.G. motor-generator, operating at a distance of 1½ miles from the station, the motor being supplied with current at 2,000 volts; one endless-rope haulage gear, driven by two A.E.G. 150-H.P. 2,000-volt motors; one main and tail rope haulage gear, driven by one A.E.G. 100-H.P. 2,000-volt motor; one 300-H.P. A.E.G. variable-speed 2,000-volt motor, driving "Sirocco" fan of 400,000 cb. ft. per minute; three A.E.G. 30-H.P. 2,000-volt motors, driving screens; one A.E.G. 50-H.P. 500-volt motor, driving 6 × 10 Worthington pump; six A.E.G. 5-H.P. motors, driving 4-in. pumps. All cables, motor-panels, switchgear, are to be of A.E.G. latest design, specially suited for underground mining work. There will also be installed two 100-H.P. A.E.G. motors, and five A.E.G. static transformers, to transform from 2,000 to 500 volts. The consulting engineer for the colliery is Mr. J. H. Newby, and the mine engineer is Mr. Mathieson.

Sydney.—The contract for a 5,000 kw. turbo-alternator has been placed with the Australian Metal Co., Ltd. (Electrical Department), Sydney, at £21,233. The list of tenders was given last week.

New South Wales.—The *Australian Mining Standard* states that the Public Works Department has ordered a "Carrick" three-motor electric overhead travelling crane for Uhr's Point workshops, £566, from J. E. O'Toole & Co., Sydney; also an electric installation at Uhr's Point power station, £1,000, from the Aust. General Electric Co.

Croydon and Dundee.—A contract for traction tantalum lamps for the Dundee tramways for the ensuing 12 months has been received by Messrs. Siemens Bros. Dynamo Works, Ltd., who have also obtained a renewal of the contract for the supply of similar traction lamps to the County Borough of Croydon for the ensuing 12 months, together with the supply of "Wotan" drawn tungsten wire lamps for depôt lighting, &c.

East Ham.—The T.C. has accepted the tender of Callender's Cable & Construction Co., Ltd., for main feeder cable.

Edinburgh.—The tender of the Bastian Meter Co., Ltd., has again been accepted by the Corporation for the supply of 2½-ampere meters.

Greenock.—The Corporation has accepted an offer of Halley's Industrial Motors, Ltd., for a motor wagon for the electricity department, for £700; also a tender of the British Westinghouse Co. for two A.C. motors for 750 kw. each, to be coupled to existing low-tension dynamos, for £2,288.

Huddersfield.—The Electricity Committee has accepted the tender of Messrs. E. Green & Son, at £866, for an economiser. The Committee has also accepted the tender of Messrs. Greenwood and Batley for a turbo-dynamo, to take the place of plant to be scrapped.

Hungary.—Messrs. Ganz & Co., of Budapest, have secured a contract for the construction of an electric tramway in the town of Kolozsvar.

Government Contracts.—The following tenders have been accepted during the past month by the Government Departments named:—

Admiralty.

Miscellaneous articles.—Chloride Electrical Storage Co., Craigpark Electric Cable Co.
Distributing boxes.—B.I. & Helsby Cables, Ltd., Chadburn's (Ship) Telegraph Co., Clarke, Chapman & Co., Hawkers, Ltd., McGeoch & Co., E. F. Moy, Ltd., Player & Mitchell, Spagnoletti, Ltd.

India Office.

Accumulators.—Pritchetts & Gold.
Boxes.—Siemens Bros. & Co.
Cable.—Bolton & Sons and Hooper's Telegraph, &c., Works.
Cells.—Tudor Accumulator Co.
Motors.—Lancashire Dynamo, &c., Co.
Switches.—Edgar Allen & Co.

War Office.

Dynamos.—J. H. Holmes & Co.

Post Office.

Telephonic apparatus.—Automatic Telephone Manufacturing Co., B.I. and Helsby Cables, Ltd., and Peel-Conner Telephone Works, Ltd.
Wood arms.—Millar's Timber & Trading Co.
Silence cabinets.—King & Scarborough.
Telegraphic cable.—Siemens Bros. & Co.
Telephonic cable.—B.I. & Helsby Cables, Ltd., and W. T. Henley's Telegraph Works Co.
Dry cells.—Siemens Bros. & Co.
Stoneware ducts.—Albion Clay Co.
Telegraphic ironwork.—Guest, Keen & Nettlefolds, Ltd., Portland Bolt and Nut Co., and C. Richards & Sons.
Morse paper.—Waterlow & Sons.
Power plant and wiring.—Niton Wireless Station.—Westminster Engineering Co.
Telephone exchange equipment.—East Exchange, London, Western Electric Co.; new Victoria Exchange, London, and Kilmarnock Exchange, Peel-Conner Telephone Works, Ltd.; City Exchange, London, (conversion to keyless working) Western Electric Co.

Crown Agents for the Colonies.

Underground telephone cable.—B.I. & Helsby Cables, Ltd.
Poles, &c.—Siemens Bros. & Co.

Leeds.—The Mirrlees-Watson Co., Ltd., of Glasgow, have recently secured a repeat order for a large surface condensing plant for the Corporation electricity works, capable of dealing with 130,000 lb. of steam per hour. The plant will be connected to a turbo-alternator, for which Messrs. Willans & Robinson have just received the order. The condenser of this installation is of a very special design, to suit the conditions of dirty water obtained for condensing purposes from the river Aire. This water contains a large amount of woollen material, which, along with mud, soon clogs up the ordinary type of condenser. The condenser is designed so that all the tubes can be cleaned out whilst the plant is in operation. The flow of the cooling water can be reversed without interfering with the running of the plant. The condenser is of the vertical type design, having 24,600 sq. ft. cooling surface. The total height of the condenser is 28 ft., and it weighs 85 tons.

London.—L.C.C.—The Highways Committee has accepted tenders for the supply of tramway parts, equipment, &c., for the year ending April 30th, 1914, from the following firms:—

Motor and generator spares.—British Westinghouse Co., Dick, Kerr & Co., and Manchester Armature Repair Co.
Controller, circuit-breaker and other switch, &c., details, and magnetic brake spares.—British Westinghouse Co. and Dick, Kerr & Co.
Contact fingers and parts, segments, &c.—British Westinghouse Co., Dyer and Young, Estier Bros., Edwin Showell & Sons, and Tramway Supplies, Ltd.
Pressed brass and steel articles.—Hadfield's Steel Foundry Co., Conveyor and Elevator Co., Peter Hooker, and M. Mole & Son.
Electric cable, fuse wire and cotton-covered copper wire.—Midland Electric Wire Co., Liverpool Electric Cable Co., W. T. Glover & Co., Hooper's Telegraph & India-Rubber Works, and Saxonia Electrical Wire Co.
Copper bonds.—B.I. & Helsby Cables, Ltd.
Rubber details.—J. G. Ingram & Son, North British Rubber Co., and I.R., G.P. & Telegraph Works Co.
Moulded insulators (other than rubber).—Ebonestos Manufacturing Co., Crystalate Manufacturing Co., and British Westinghouse Co.
Fibre articles.—J. Burns, F. A. Hill & Co., and Mosses & Mitchell.
Mica and micanite articles.—D. Jaroslaw and George Schulz & Co.
Insulators and porcelains for electric trackwork.—Bullers, Ltd., Doulton and Co., and Taylor, Tunnicliff & Co.
Baking and air-drying insulating varnisher.—Pinchin, Johnson & Co. (three years).
Car furniture.—Edwin Showell & Sons, Player & Mitchell, Brush Electrical Engineering Co., G. D. Peters & Co., and Gabriel & Co.
Machined bronze bearings.—Anti-Attrition Metal Co.
Machine-finished articles (brass, gun metal, &c.).—Edwin Showell & Sons, Estier Bros., Anti-Attrition Metal Co., Player & Mitchell, and Davis and Timmins.
Machine-finished articles (iron, steel, &c.).—Wilkes, Ltd., British Westinghouse Co., Bayliss, Jones & Bayliss, E. H. Bentall & Co., Davis and Timmins, F. W. Cotterill, Louis Hervé, John Holroyd & Co., Ibbotson Bros. & Co., and F. W. Rowlands & Co.
Gear and pinion wheels, ratchets, worms, &c.—British Hele-Shaw Patent Clutch Co., John Holroyd & Co., and F. W. Rowlands & Co.
Drop forged stampings.—Charles Bunn, Woodall & Co., Armstrong, Stevens and Son, and Wilkes, Ltd.
Iron and steel forgings.—Male & Jordan, Hurst, Nelson & Co., Woodall and Co., W. J. Ritchie & Co., Bayliss, Jones & Bayliss, Chas. Bunn, Wilkes, Ltd., and East Ferry Road Engineering Works Co.
Springs.—Lion Spring Co., Geo. Salter & Co., Smith Bros. & Hill, Joseph Steel & Sons, Tempered Spring Co., and West Bromwich Spring Co.
Machined iron castings.—Carron Co., John Crowley & Co., H. Newton Knights & Co., and Thomas Summerson & Sons.
Iron castings.—Brightside Foundry & Engineering Co. and Joseph Williamson & Co.
Machined malleable iron castings.—Bullers, Ltd., Leys Malleable Castings Co., and Brecknell, Munro & Rogers.
Malleable iron castings.—John Crowley & Co. and Brydon & Co.
Steel castings (machined and unmachined).—Thomas Firth & Sons, National Steel Foundry, Ltd., Samuel Peace & Sons, Edgar Allen & Co., F. W. Rowlands & Co., Hadfield's Steel Foundry Co., and H. R. Marsden, Ltd.

In their observations on the tenders, the Highways Committee say that, with a few exceptions, they have accepted the lowest tender in each case. For certain items, two or more firms, some of them the present contractors, submitted the same prices, and the Committee have, in most of these cases, accepted the tender of the present contractors. "The prices received for certain of the items are unfavourable, and we submit a recommendation that the tenders therefor should not be accepted." They recommend that none of the tenders for the following be accepted:—

Schedule.	*No. of item.*
T. 8 (contact-fingers and parts, &c.)	28
T. 10 (moulded insulators, other than rubber)	4
T. 14 (baking and air-drying varnishes)	2 and 4
T. 18 (machine-finished articles—brass, gun-metal, &c.)	15
T. 19 (machine-finished articles—iron, steel, &c.)	13
T. 22 (iron and steel forgings)	15
T. 29 (steel castings, machined and unmachined)	2

The Fire Brigade Committee recommends for acceptance the tender of "Cedes" Electric Traction, Ltd., for two electrically-driven motor escape vans, for £1,668, the company to be allowed to sub-let the supply of the batteries to the Tudor Accumulator Co., Ltd.

The Highways Committee received the following tenders for (1) the reconstruction, for electric traction, of the existing horse tramways from Highbury Station to City Road, *via* St. Paul's Road, Canonbury Road, New North Road and East Road; and (2) the reconstruction of the tramways from Chapel Street to Nile Street, Woolwich, and the construction of the authorised tramways from Catford to Southend, *via* Bromley Road. The tenders also contain provision for certain paving and other works outside the tramway tracks in connection with street widenings along the routes of the

tramways from Highbury Station to City Road, and from Chapel Street to Nile Street. The improvement works to be done by the contractors along the latter route, however, form only a small portion of the total, the remainder of which will be executed by the Woolwich Metropolitan Borough Council on the Council's behalf:—

(1) *Highbury Station to City Road tramways.*

	Tramway works.	Improvement works.	Total.
A. N. Coles	£45,772	£4,335	£50,107
John Mowlem & Co., Ltd.	48,589	4,799	53,387
Dick, Kerr & Co., Ltd.	50,796	4,785	55,582
G. Percy Trentham, Ltd.	57,034	4,572	61,607

(2) *Chapel Street to Nile Street, Woolwich, and Catford to Southend tramways.*

	Tramway works.	Improvement works.	Total.
A. N. Coles	£39,425	£1,089	£40,515
John Mowlem & Co., Ltd.	40,641	1,479	42,120
George Wimpey & Co.	41,531	1,301	42,833
Dick, Kerr & Co., Ltd.	43,228	1,464	44,692
G. Percy Trentham, Ltd.	52,249	1,400	53,649

The lowest tender in each case is that submitted by Mr. A. N. Coles. The Committee say:—"We have given very careful consideration to the question of the steps to be taken to provide for the electrification of these three tramways in the shortest time possible, and with due regard to the work being executed to the satisfaction of the Council. It is probable that the work on the three routes will be in progress at the same time, and as the work from Highbury Station to City Road will have to be carried out in two portions, and is situated at a considerable distance from that to be undertaken south of the Thames, we feel that the Council's interests would best be served by entrusting the works to two contractors, instead of the whole of the works being done by one contractor. We accordingly propose that the reconstruction of the tramways from Highbury Station to City Road should be undertaken by Mr. A. N. Coles, and that the construction and reconstruction of the Catford to Southend and the Chapel Street to Nile Street tramways should be undertaken by John Mowlem & Co., Ltd., the firm submitting the second lowest tender."

The tenders received for the rewinding, &c., of 17 300-KW. and three 500-KW. motor-generators at tramway sub-stations were:—

Newton Bros. .. .. (recommended)	£7,987
Manchester Armature Repair Co.	8,830
Dick, Kerr & Co., Ltd.	14,100
British Westinghouse Electric Co.	21,321

ISLINGTON.—The Guardians have accepted the tender of the General Electric Co., Ltd., for a supply of electrical fittings and sundries.

LEWISHAM.—The B. of G. on Monday were informed by the Works Committee that Messrs. W. R. Reynolds, whose tender had been accepted for the electrical installation at the workhouse and infirmary, had withdrawn, as they had omitted to include the prices for lamps and fittings. Their tender was for the infirmary £479, and for the workhouse £449. In pursuance of the Board's instructions, they had accepted the tender of Mr. A. J. Hewens for the infirmary, his price being £749, and he had signed the contract. With regard to the workhouse installation, Messrs. Weston & Sons, whose price was £640, had written that they did not feel justified in taking the work on at the price quoted, £640, and made another offer. The Committee recommended that the tender of Messrs. Haycroft, Ltd., be accepted, for £759 10s.

Mr. J. Clemow inquired whether any communication had been received from Messrs. Tredegar & Co., whose tender was £668.

The Clerk said the firm had not been communicated with.

Mr. Clemow proposed that the report be referred back, with a view to Messrs. Tredegar being asked if they stood by their tender.

Mr. J. Weeks, in seconding, said there was a difference of close on £100 between the two tenders, and, in fairness to Messrs. Tredegar, they should have an opportunity of declining the work.

Mr. W. Wood said the desire of the Committee was to avoid "any more fooling about." The specifications were absolutely perfect.

Mr. Weeks replied that the specifications were sent out at 10 o'clock at night, and decided upon the next day. He was not surprised that the experts could not understand them.

The Board referred the matter back to the Committee for further consideration.

Lymington (Hants.).—The T.C. has accepted the tender of the Lymington Electric Light & Power Co. for installing the electric light at the offices, at £65. The only other tender was from Messrs. F. W. Cook & Son, of Southampton, at £60.

Mansfield.—The Mansfield Engineering Co. has been appointed to supply wiring sundries to the T.C. for the current year.

Oban.—The T.C. Lighting Committee received tenders from Callender's Cable Co., Ltd., and the British Insulated & Helsby Cables, Ltd., for renewal of certain portions of defective cable. The offer of Callender's Cable Co. was accepted.

Paisley.—Messrs. Siemens Bros. have received a contract for a 500-KW. rotary converter for the electricity works, at £1,477. Five firms tendered.

Salford.—The Education Committee has accepted the tender of Messrs. Willoughby & Wilcox for wiring in the new laboratories and workshops, for the sum of £40. The Juvenile Employment Sub-committee has accepted the tender of Messrs. Davenport, Sparrow & Co. for electric lighting at the Employment Bureau. The Electricity Committee has accepted the offer of Messrs. J. Jewel & Sons, Birmingham, for the purchase and removal of the No. 1 engine and generator at the electricity station, for £800. The tenders of the following for the purchase of quantities of waste turbine and crank chamber oil have been accepted:—Mr. E. W. Wollaston, 12 barrels, at 13s. per barrel; Mr. E. Spencer, 39 barrels, at 9s. per barrel.

South Africa.—Messrs. Siemens have obtained a contract for the yearly supply of "Wotan" drawn tungsten wire lamps to the Government of the Union of South Africa.

Swindon.—The T.C. has accepted for the ensuing year the tender of the Reason Manufacturing Co., Ltd., for miniature and single-tube type electrolytic meters.

Swinton and Pendlebury.—The U.D.C. has accepted the following tenders in connection with the erection and equipment of the Broad Oak Park sub-station:—

W. Farnworth & Son.—Building, £48.
General Electric Co.—Switchgear, £119.
General Cable Manufacturing Co.—Supply main, £205.

West Ham.—The T.C. has accepted the offer of Messrs. Cory & Son to supply the following coal to the electricity works during a period of 13 months:—5,917 tons of peas, 10s. 2d. per ton; 6,000 tons ditto, 13s.; 41,000 tons ditto, 16s. 3d.; 6,881 tons of rough, 10s. 2d. per ton.

FORTHCOMING EVENTS.

Physical Society.—Friday, April 25th. At 5 p.m. At the Imperial College of Science, South Kensington, S.W. Paper on "Some Experiments to Detect β-rays from Radium-A," by Messrs. W. Makower and S. Russ; and other papers.

Junior Institution of Engineers.—Friday, April 25th. At 8 p.m. At 39, Victoria Street. Paper on "Condensing Machinery," by Mr. J. Elliott.

"Northampton" Past Day-Students' Association.—Saturday, April 26th. At 5 p.m. At the Northampton Institute, E.C. Annual general meeting.

Institution of Civil Engineers.—Monday, April 28th. Students' meeting. At 8 p.m. Lecture on "Law in Relation to Engineering," by Mr. T. Frame Thomson.

Tuesday, April 29th. At 8 p.m. At the Institution of Mechanical Engineers. Annual general meeting.

Institution of Electrical Engineers (Newcastle Students' Section).—Monday, April 28th. Paper on "Cascade Connections," by Mr. H. V. Henniker.

(London).—Thursday, May 1st. At 8 p.m. Paper on "The Use of the Electrostatic System for the Measurement of Power," by Messrs. C. C. Paterson, E. H. Rayner and A. Kinnes.

Illuminating Engineering Society.—Tuesday, April 29th. At 7.30 p.m. At the Royal Society of Arts. Discussion on paper on "Standard Clauses for Inclusion in a Specification for Street Lighting," to be resumed.

Royal Society of Arts.—Wednesday, April 30th. At 8 p.m. Paper on "The Science Museum," by Mr. F. G. Ogilvie.

Society of Engineers.—Saturday, May 3rd. At 8 p.m. At the Holborn Restaurant. Bohemian concert.

Salford Technical and Engineering Association.—Saturday, May 3rd. Visit to the Economiser Works of Messrs. E. Green & Son, Ltd., Wakefield.

THE ELECTRICAL ENGINEERS
(LONDON DIVISION).

Commanding Officer—LIEUT.-COL. H. M. LEAF.

The following orders have been issued for the current week:—

Monday, April 28th.—"A" Company. Recruit training, 7 to 8 p.m.; company training, 7 to 10 p.m.

Tuesday, April 29th.—"B" Company. Recruit training, 7 to 8 p.m.; company training, 7 to 10 p.m.

Thursday, May 1st.—"C" Company. Recruit training, 7 to 8 p.m.; company training, 7 to 10 p.m.

Friday, May 2nd.—"D" Company. Recruit training, 7 to 8 p.m.; company training, 7 to 10 p.m.

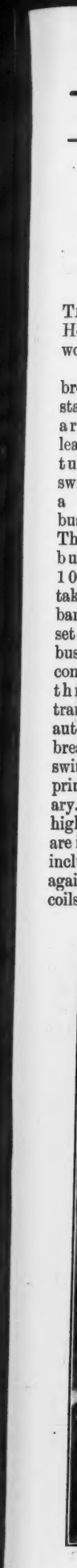
Saturday, May 3rd.—All Companies. Annual musketry at Purfleet Rifle Ranges. Trains leave Fenchurch Street Station, Midland Railway, Tilbury Branch, at 1.15, 1.85 and 2.15 p.m. Men arriving by later trains will be unable to fire. Rifles, &c., are provided for at the Ranges.

Headquarters will be opened for regimental business from 10 a.m. till 12 noon.

(Signed) P. H. CAMPBELL, Capt. R.E., and Adjt.
For Officer commanding L.E.E.

French Electrical Steel.—The production of steel in France by means of the electric furnace amounted in 1908 to 2,289 tons crude, and 1,235 tons finished. In the three years to 1911 the output rose to 13,850 tons and 8,898 tons respectively. As France is the birthplace of the electric furnace, this result may be regarded as only natural.—*La Revue Electrique.*

Scarcity of Engineering Apprentices.—A correspondent writes:—"Attracted by the short hours now being worked, and the good wages being earned by colliery lads, many strong-built boys in central and south-east Lancashire are preferring the coal mine to the foundry or the cotton mill. It is stated that there is a growing scarcity of apprentices in the engineering industry in the Bolton district, one large firm of textile machinists offering increased wages in order to attract youths."



THE ELECTRICITY WORKS OF TROLLHÄTTAN.

(*Concluded from page* 644.)

The large turbines were supplied by Messrs. Nydqvist and Holm at Trollhättan and Messrs. Boving & Co.'s branch works at Kristinehamn.

Each alternator is provided with an automatic circuit-breaker in the power station, from which armoured cables lead through the tunnel to the switch-house, where a duplicate set of bus-bars is provided. The power distributed locally at 10,000 volts is taken off these bus-bars, while a single set of 50,000-volt bus-bars can be connected to them through step-up transformers, with automatic circuit-breakers and oil-switches on both primary and secondary. Three extra-high-pressure lines are in use at present, including a double one to Gothenburg. Elaborate protection against lightning discharges is provided, including choking coils, horn arresters shunted by oil-resistances, series-connected liquid resistances, roller lightning arresters, and water-jet dischargers. The transformer secondaries are also protected with inductance coils, and spark gaps between the phases and the neutral point. The connections of the 10,000-volt generator are of bare copper bar carried on insulators; on the 50,000-volt switchgear, copper tubes are employed. Intermediate wiring is done with lead-sheathed and steel-armoured multi-core cable, laid on shelves; the wiring for a group of apparatus belonging to a single unit, such as current transformers, relays, &c., is all embodied in one cable. Fireproof divisions are provided between conductors of different phases, with a metal screen in front of them, and all oil-immersed apparatus are lodged in fireproof cells.

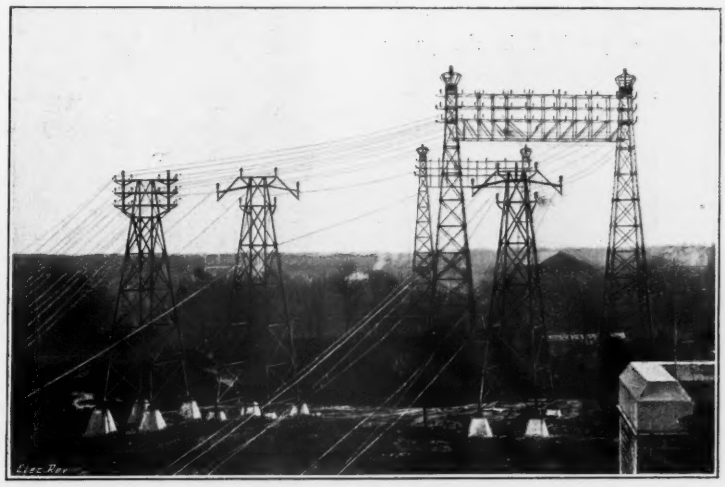


Fig. 7.—Feeders leaving Power Station.

Views of the different types of bus-bars and switchgear are given in figs. 13 to 15.

The transformer primaries are delta coupled and the secondaries in star; the guaranteed efficiency of each at 3,000 K.V.A. ($\cos \phi = 1$) and 10,000 volts is 98·5 per cent.

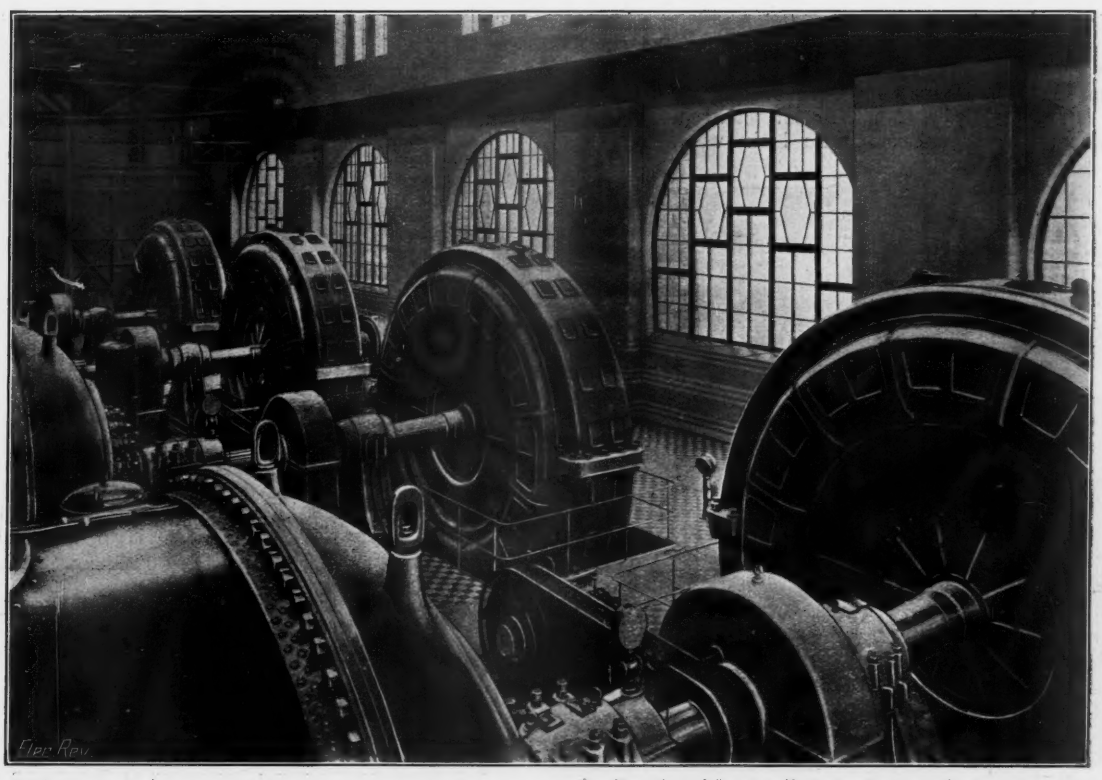


Fig. 8.—Interior of Turbine Room.

They were required to withstand a short circuit on the network with the whole station in parallel. The windings were tested with double the working voltage for a quarter of an

hour, and will carry continuously a load of 3,670 K.V.A. with a rise of temperature not exceeding 60° C. The oil tanks are made of boiler plate with welded joints, and are absolutely air and oil-tight. The cooling water is circulated through coils of copper pipe, 60 litres per minute being required for this purpose. The active part of each transformer weighs 16 tons, the tank and oil weighing 12 tons. Alarm devices are provided, which give warning of high or low level of oil, due to excessive temperature on the one hand, or leakage on the other. Direct-reading and distance thermometers are also employed, the latter communicating with the switch-room, where an elaborate system of signals worked by relays, with alarm bells and lamps, is installed.

A 60-ton travelling crane was provided in the power

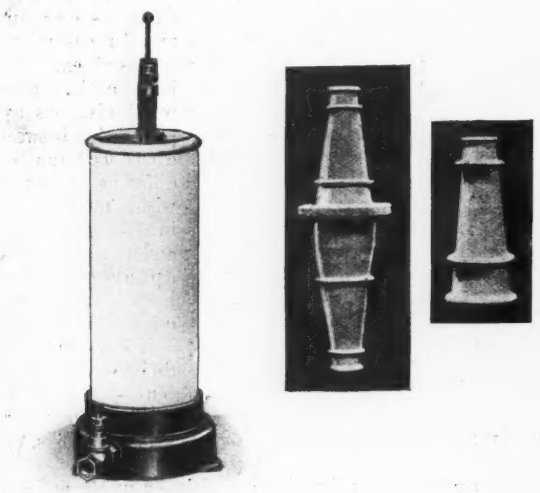


Fig. 9.—Water-Column Line Discharger, and Porcelain Insulators.

station, and a 42-ton gantry crane to lower the machinery from the railway track on the cantilever to a lower track on a level with the site of the power station—a height of about 30 m. (fig. 11). A special friction brake was provided on the latter, cooled by circulating oil forced between the friction disks; an electromagnetic brake was also fitted.

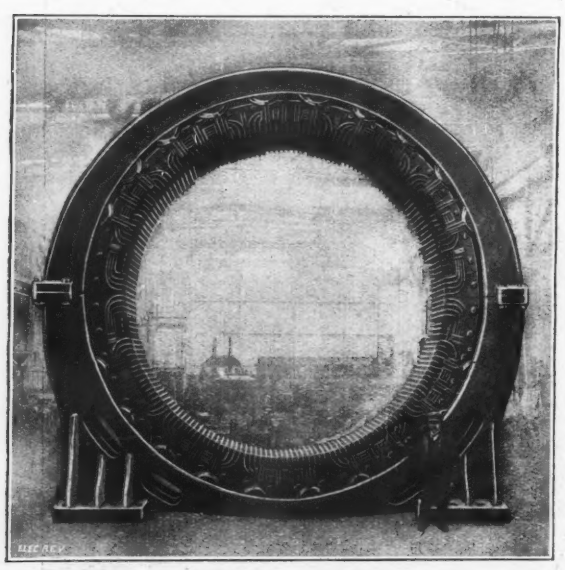


Fig. 10.—Stator of 11,000-K.V.A. Three-Phase Alternator.

The travelling crane is provided with a 10-ton crab in addition to the big one, as the latter will seldom be used, and the former works at a much higher speed.

Special porcelain insulators have been designed by the Almänna Svenska Electric Co. for use on the Trollhättan undertaking. The ruling feature of these is the plain conical shape, with only one or two drip flanges near the ends; leading-through insulators are made of two such cones fixed together at their bases. The great advantage of the smooth exterior is that the insulator is unaffected by arcing-over, where ribbed types would be split by the heat of the arc. Examples are shown in fig. 9.

Fig. 11.—Cantilever Gantry Crane, 42 Tons.

The company state that the disadvantages of corrugations outweigh their advantages. The smooth insulators, when exposed to a moist atmosphere, are quickly dried by the slight leakage currents, and are less liable to become covered with a film of dirt and moisture than corrugated insulators.

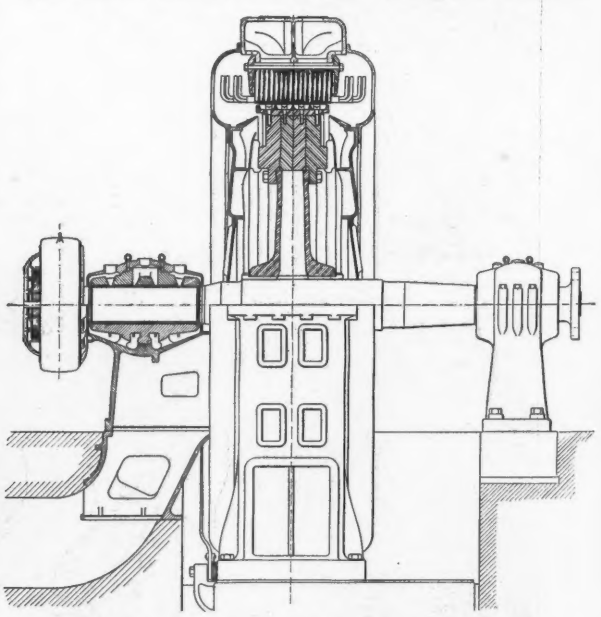


Fig. 12.—Part Sectional Elevation of Generator.

The potential gradient and electrostatic surface density are also uniform all over, and the mechanical strength of the plain conical shape is exceptionally great, the insulators being superior not only when subjected to heavy stresses, but also when undergoing shock and vibration during transport.

Cast-iron plugs are cemented into the top and bottom of the conical insulators, affording a convenient means of fixing the insulators and any apparatus that may be attached to them. One of the chief advantages of the smooth surface is the ease with which it can be kept clean; the economy of material and light weight, and the possibility of making large sizes in one piece, as the porcelain stands the oven well, are further points in their favour, tending to cheapness and ease of standardisation. In the case of leading-in insulators, the possibility of puncture has to be considered; this is guarded against by increasing the diameter of the base of the insulator. The arcing-over voltage for these smooth insulators is practically the same as for air; the presence of flanges, which produce non-uniform electrostatic density with resulting ionisation of the air, is found to reduce the arcing-over value in the older types of insulator. The arcing voltage being thus definitely known, the factor of safety can be closely determined, and in the case of the Trollhättan installation the makers have supplied insulators having a factor of safety of 10 for 10,000 volts, and 4·5 for 50,000 volts. Immersing the insulators in a cloud of steam reduced the factor of safety by 40 per cent., rather more than the reduction on flanged insulators, but, on the other hand, the smooth insulators dry themselves more readily and keep cleaner.

The main circuit-breakers are of the oil-immersed type, mechanically or electrically operated. Those which are

Fig. 14.—First Floor of Switch-House; 10,000-Volt Bus-bars.

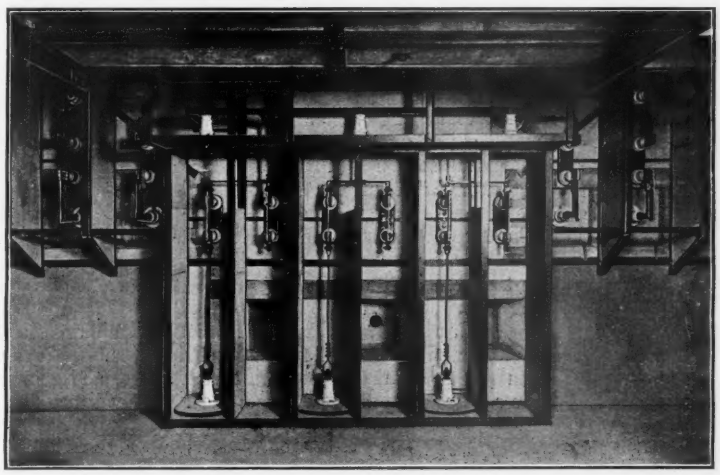


Fig. 13.—Ground Floor of Switch-House; 10,000-Volt Bus-bars and Disconnectors.

automatic are controlled by low-voltage relays, which are all of the same pattern and size. The oil-tanks are all arranged so that they can easily be lowered to expose the contacts for inspection; for the larger sizes special trucks are provided to facilitate this operation, as shown in fig. 17, with motor-driven lifting-frames. The electric operation of the switches is effected with direct-current solenoids, and the controlling switches are provided with special signalling and interlocking devices; normally each of the controlling handles stands at a middle or zero position, whether the circuit-breaker is closed or open, and no signal lamps are alight, but the operation of a circuit-breaker is at once signalled on the control board. If a breaker is closed on a short circuit, it automatically opens instantly, and cannot again be closed until the control handle has first been moved to the "off" position. Some of the oil circuit-breakers are provided with charging resistances on each pole, in series with the line, so that when switching on, the pressure is applied in two approximately equal stages. By this means the current rushes often experienced when switching-on a transformer are avoided, a precaution of special importance when low frequencies are employed. The resistances are also of advantage when charging long lines or underground cables. These resistances are put inside the apparatus.

Before adopting the design of the circuit-breakers, the first one was subjected to a mechanical test by switching it on and off 10,000 times. The circuit-breakers were also tested on loads of 20,000 K.V.A. In the 50,000-volt circuit-breakers, seen in the middle of fig. 17, the distance between phases is 90 cm.

All the oil circuit-breakers on the distributing system which are arranged for automatic overload release have time-limit relays; those in the power station and main sub-stations are of the Siemens-Schuckert induction motor type,

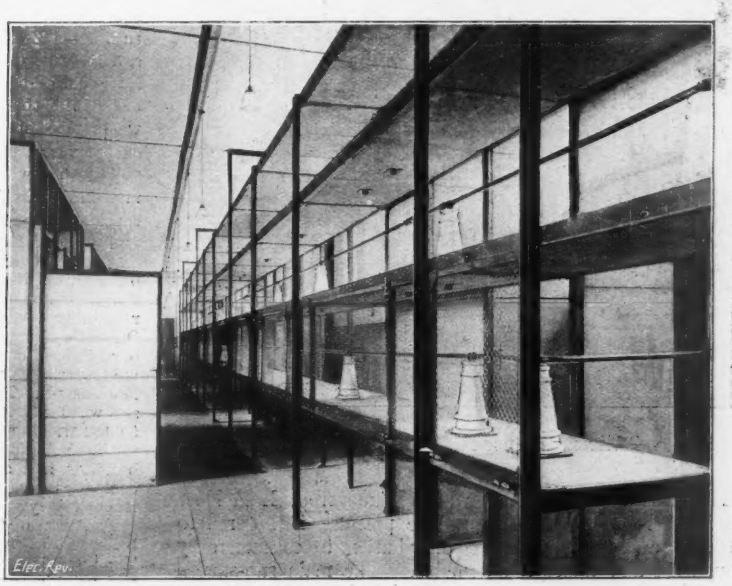


Fig. 15.—Second Floor of Switch-House; 50,000-Volt Bus-bars.

which can only be worked with current from a separate source. For smaller switches the Almänna Svenska Electric Co. has developed a cheaper relay, which is released with current derived from the current transformer; this is of the solenoid type, and of specially strong construction, with separate graduated scales for regulating the tripping current and the time-lag respectively.

Choking coils are provided in all outgoing lines between the switchgear and the lightning arresters, as well as on the 50,000-volt side of the transformers; the latter also have reinforced insulation between the turns near the terminals. The lightning arresters are of the roller air-gap type, in series with carborundum rod resistances, and of the horn type, also in series with resistances. A continuous path to earth, to take off static charges, is provided by water-jet arresters, of which a set is shown in fig. 16; these are installed on the 50,000-volt mains. On the longest 10,000-volt lines the same purpose is served by the water-column in a glass tube shown in fig. 9. The neutral-point of the generators is earthed through a grid resistance designed to carry 15 times the normal current with one phase earthed, for a period of 30 seconds. The neutral point of the high-pressure side of the transformers is similarly earthed.

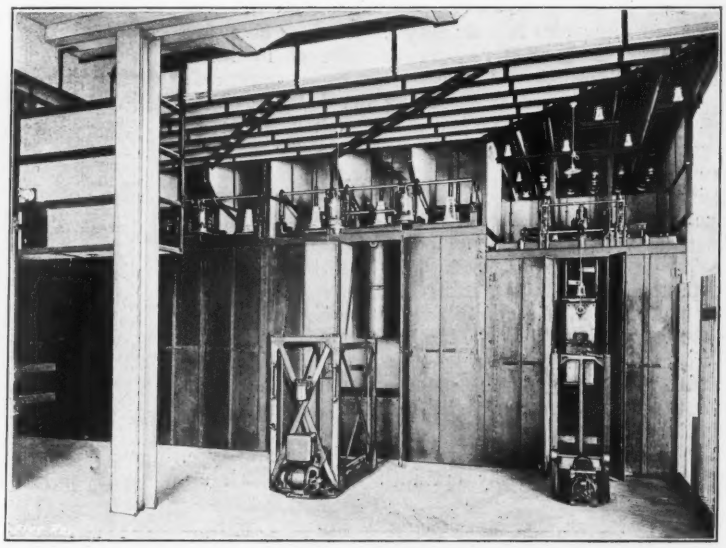


Fig. 17.—Oil-Switches for 10,000 and 50,000 Volts in Sub-Station at Gothenburg.

At present ten 10,000-volt lines leave the Trolhättan switch-house, of which six are overhead and the rest underground; all these supply power to consumers in Trolhättan and the vicinity. A single 50,000-volt line runs to Hakantorp, Skara and Sköfde, and a double one to Lilla Edet, Nol, and Gothenburg, with a branch from Lilla Edet to Alingsas. At Gothenburg the pressure is lowered to 10,000 and 6,000 volts for distribution to consumers by overhead and underground mains. The main sub-station contains seven 3,000-K.V.A. single-phase transformers, forming two three-phase sets with star-connected primaries, one transformer being spare. By means of a star-delta switch the secondaries can be connected either in star on the 10,000-volt bus-bars, or in delta on the 6,000-volt bars. Ultimately there will be 15 single-phase transformers in this sub-station, with five incoming 50,000-volt lines, and 24 outgoing 10,000-volt feeders. The automatic signalling system mentioned in connection with the generating station is fully utilised here also, there being 180 indicators, with lamps and alarm bells, connected with the transformer cooling devices, automatic circuit-breakers, &c. The Corporation of Gothenburg takes energy from the sub-station at 6,000 volts, and distributes it to power consumers in the town, in addition to that derived from its steam generating station.

The distance from Trollhättan to Gothenburg is about 80 km., and to Sköfde 100 km. Primary sub-stations are situated at all the points mentioned above, and there are several secondary sub-stations on the 10,000-volt mains.

Fig. 16.—Water-jet Dischargers for 50,000-volt Lines.

Explosion of a Turbo-Dynamo.—A serious mishap, of a nature fortunately rare in these days of powerful generators, occurred on March 8th last in the Essen power station of the Rheinisch Westfalischen Co. Shortly after 11 p.m., the No. 4 turbine—a Zoelly machine running at 1,000 R.P.M. and coupled to a 5,000-KW., 0 8 power-factor, 5,250-volt alternator with salient rotor poles—began to emit peculiar rising and falling sounds; meanwhile the output of the machine fluctuated widely. The set was at once unloaded, the main switch being opened when the output was reduced to 900 KW. The alternator then showed normal voltage, but, while the main stop valve was being closed, the whole machine "burst." Wreckage flew in all directions and wrought considerable havoc. One piece of the stator, weighing several tons, was thrown through the wall of the power house, and, having damaged the tramway track, ricochetted against and damaged a building on the opposite side of the street. Five of the poles, weighing about 2,000 lb., were hurled through the roof, while the remaining seven were found in various parts of the power house. One pole soared over the houses on the other side of the street and buried itself deeply in the ground, while two others were found well over 100 yards away near the coke ovens of the Victoria Mathias pit. The engine room was strewn with splinters of iron and wood after the disaster, but with the exception of an adjacent 5,000-KW. set which was set on fire, no serious damage was done to the remaining valuable plant in the building. The power house building and some of the adjacent property belonging to the company were, however, badly damaged, but fortunately no loss of life or injury to person was involved.

The cause of the disaster has not been determined, and it is not believed that any definite conclusion can be reached in this respect. The town fire brigade and the station staff, aided by employés from the neighbouring colliery, soon restored comparative order to the works, and it is worth recording that current supply was only interrupted for about five minutes.

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NOTES.

New Units, Abbreviations and Symbols.—The Elektrotechnischer Verein, the V.D.I., and other associated bodies, have recently published amended recommendations for the nomenclature and notation of mensuration, time, mechanical, heat, light and electrical units and magnitudes. Most of the abbreviations recommended are of obvious significance, a large number being already in general use, but among the arbitrary, or less easily intelligible ones, may be noted:—μ = 0·001 mm.; λ = 0·001 ml. = 0·001 cc.; dt. (= decitonne) = 100 kg.; γ = 0·001 mg. Time *intervals* are represented by h., m., s., written on the line, and *instants* of time are denoted by the same abbreviations set above the line (thus, $4^{h.}$ $50^{m.}$). The dyne is too small a unit for use in practical work, hence a new unit of force, the *vis*, is introduced. The *vis* is that force which imparts 1 metre per sec. per sec. acceleration to a mass of 1 tonne; 1 vis (= 1 v.) = 10^6 dynes, and is approximately equal to the weight of 100 kg. The corresponding work unit is the *vismetre* (vm.); and the power unit, 1 vm. per sec., is familiar under the name kilowatt. Again, 1 *bar* = weight of 1 grm. at 45° latitude; 1 kb. = weight of 1 kg.; 1 mb. = 1 megabar = weight of 1 tonne. It is clear that 1 v. = 102 kb. approximately; 1 KW.-hour = 3,600 vm.; 1 vm. = 1 kilo-joule = 1 kj. (= 102 kbm. approx.); 1 barmetre = 1 bm. = 1 grm.-metre; 1 vm. per sec. = 1 KW. (= 1 GP. = 1 Grosspferd). The Hefner C.P. is denoted by HK.; the Hefner-lumen by Lm.; the Hefner-lux by Lx. 1 microfarad is denoted by μF.; and the ohm by Φ, and the megohm by $M\Phi$.

Copper.—Messrs. Merton's mid-monthly circular gives particulars of the stocks in England and France and afloat thereto from Chile and Australia on April 15th, 1913. These amount to 32,901 tons, an increase of 640 tons on the quantity registered on March 31st. While English stocks have increased 526 tons, and French 264, and the quantity afloat from Chile is 350 tons better than on March 31st, Australian shipments are 500 tons less, an amount nearly corresponding to the English gain. For the first fortnight of April the arrivals from North America are one-third above average. Spain and Portugal send a small quantity (668 tons) to England and France, but full average to other European countries. Chile shipments are average, and Australian very slightly below. Total deliveries, at 27,221 tons, are high, and denote an encouraging demand. During March American stocks were reduced by a considerable amount, 8,050 tons. The combined visible supply (excluding Holland and Germany), consequently lowered by a larger figure than has been recorded since April, 1912, viz., 11,935 tons. The world's supply (including Holland and Germany, and estimated in other ports) shows a decrease of 7,649 tons for March.

Annual Concert.—LONDON.—The staff of the Electrical Engineer's Department of the Great Eastern Railway Co. held their annual smoking concert at Cannon Street Hotel on Saturday, April 19th, and, with their friends, assembled in great force. Mr. H. W. Firth, M.Inst.C.E., presided, and was supported not only by several of the officers of the Great Eastern and other companies, but by several eminent gentlemen engaged in the electrical engineering world, amongst whom may be mentioned: Mr. Wm. Duddell, President of the Institution of Electrical Engineers; Mr. A. H. Walton, of the British Thomson-Houston Co.; Messrs. T. Stevens, John Wilson, J. Robertson, E. P. Grove, C. Busk, E. Barton, S. A. Parnwell, G. Keary, A. O. Shave, A. P. Parker, A. W. Polley, G. P. Parker, and C. S. Egerton. An enjoyable musical programme was interspersed with various toasts. Mr. E. P. Grove, of the London Underground Electric Railways, proposed the "Success of the Chairman, Directors and Officers of the Great Eastern Railway," remarking that, although his association with that company had been but of short duration, only dating from the extension of the Central London Railway to Liverpool Street, it had, nevertheless, been of a very cordial nature, and he could therefore honestly wish them every success. Mr. C. Busk, Continental traffic manager, suitably responded in a humorous speech. The next toast, that of "The Visitors," was submitted by Mr. F. W. Leake, who extended a very hearty welcome to all visitors present. Mr. Wm. Duddell, in reply, expressed the pleasure it gave them to be present, and dealt with electrical topics past and present. The toast of "The Chairman," which was received with great enthusiasm and musical honours, was very ably proposed by Mr. Robertson, of the Tilbury Railway, in response to which Mr. Firth thanked all for their kindness, expressed his gratitude for the loyal support he had received from the staff connected with his department, and stated that any success which had been achieved was due to one and all. He further remarked that he felt that the work of the department was being based on sound principles, and impressed upon the younger men the necessity of being interested in their work and endeavouring to make themselves thoroughly proficient in their various spheres. Mr. D. James proposed a hearty vote of thanks to the Committee. This was seconded by Mr. F. A. Kaffrell and responded to by Mr. J. W. Ball, hon. sec.

Fatalities.—HEBBURN.—A mysterious explosion occurred at Hebburn-on-Tyne on March 30th, by which a man named Collinson, and a woman named Gray, were killed, being blown through the ceiling of a house. The explosion was generally attributed to gas, but the evidence given at the resumed inquiry on April 17th suggested that the electric light service might be, in part at least, responsible. The Northern Counties Electric Supply Co. was represented by Mr. Burton, Newcastle-on-Tyne, and amongst the experts present were Prof. W. M. Thornton, Professor of Electricity at Armstrong College; Mr. F. O. Hunt, Assistant Lecturer in Electricity at Armstrong College; Prof. J. A. Smythe, Lecturer in Chemistry at Armstrong College, and representatives of the local gas companies. Before resuming the taking of evidence, the jury inspected the electrical cable that had been taken from the site of the explosion.

Annie Collinson, daughter of the deceased man, said that about noon on the morning of the explosion she noticed a blue coloured smoke coming through the skirting board of the front room. She thought the smoke smelt like rubber burning. She told her father, who pulled the skirting board up and sent witness for water. The deceased woman, Mrs. Gray, her grandmother, then entered the room. Her father sprinkled water on the place, and just as she left the room to get more water she heard an explosion. In answer to questions, witness said she did not see any flame. There was a fire in the kitchen, but not in the front room.

John Hately, manager of the Ellison House Hotel, on the opposite side of Lyon Street to that in which Collinson's house was situated, said he was in the hotel cellar about the time the explosion took place, when the electric lights gradually went out, and he afterwards found that all the electric lights in the house were out. Shortly after the lights went out the explosion occurred The electric supply was drawn from the main which ran along the front of Collinson's house.

Constable Robson and John George Bennett, who were first on the scene after the explosion, said that immediately inside the doorstep of Collinson's house they saw a flame, which was more noticeable near the window.

Inspector Riddell also spoke to the flame; it was a "gassy" flame. He was of opinion the explosion was caused by a fused cable. When the electric cable was opened he detected a smell similar to that which he found in the house after the explosion. The cable was covered with tiles, but he thought there was a small breach.

At this point the inquiry was adjourned for a week, in order that an expert examination might be made of the electric cable and gas mains.

COATBRIDGE.—The *Glasgow Daily Herald* reports that Robert Hall, 51, a bellman or engine-keeper, was killed while employed in Lochrin Ironworks. "He was engaged trimming an electric lamp in the smithy, and had got on to some iron bars instead of a wooden board which he was in the habit of standing upon. He fell among the iron bars in an unconscious state." Artificial respiration was resorted to, but without effect

ROCHDALE.—An inquest was held at Radcliffe, near Manchester, on Monday, into the cause of the death of a joiner named Geo. Hampson, who was killed at Mount Zion Bleach Works, near Rochdale. Evidence showed that the works were burnt out a month ago, and were being rebuilt. A fencing was necessary to protect the workmen using the scaffold from the dangers of a 10,000-volt live wire. The clerk of works informed the Coroner that he had specially warned the deceased of the danger of the wire, telling him that it meant instant death. The evidence showed that the deceased must have got over the fencing, and beneath the wire, and in a moment of forgetfulness had allowed his head to come in contact with it. The jury returned a verdict of "Accidental death."

Association of Electrical Station Engineers.—A meeting was held at Manchester on April 17th, 35 gentlemen being present. The proceedings were opened by the chairman (Mr. J. W. Lanham), who in a brief statement gave an outline of the work already done by the branch, and, for the benefit of the new members present, explained the general aims of the A.E.S.E. The main business of the evening was to elect the permanent committee. It was resolved that it should consist of 12 members, at least one being appointed from each district represented, three from Manchester, and one from a private plant. The last-named representative will not be appointed until a few more engineers from private plants have become members of the Association. Mr. F. Clarke was appointed assistant secretary. It was resolved that the next general meeting should take the form of a social evening, the first portion being allotted to a paper and discussion on the general status of the profession and the usefulness of an Association. The hon. secretary, Mr. J. W. Thomas, B.Sc. Tech., will read the paper. The date of next meeting will be duly announced, and further details can be obtained from the hon. secretary (Manchester Branch) A.E.S.E., 15, Lotherton Street, Harpurhey, Manchester.

A meeting of the Bradford Section of the Association was held on 16th inst., for the purpose of completing the organisation of the Section which was commenced in March. The chair was occupied by Mr. W. C. Ekin, senior, charge engineer at the Bradford electricity works (chairman of the Section), and there was a good attendance. It was reported by Mr. Chas. H. Broadbent (the hon. secretary) that 30 applications for membership had been received, these being from engineers in Bradford, Dewsbury, Colne, Shipley, Rotherham, Barnsley and Keighley, and that other applications were pending. It is proposed, as soon as the Section has been got into full working order, to arrange for social events in the summer months and lectures for next winter. After the replies from London with regard to some of the resolutions passed at the previous meeting had been discussed, the question of a delegate to the Conference arose, and it was unanimously agreed that Mr. C. H. Broadbent should represent the Bradford Branch. A discussion then ensued on the subject of increasing the membership of the

branch, and it was pointed out that a large number of men in the Bradford district were a little perturbed with regard to the effect of joining the Association on their future prospects; but it was easily shown that the main object of association was to improve their prospects and better the general conditions. Mr. C. H. Broadbent, 129, Hartington Terrace, Lidget Green, Bradford, is the hon. secretary for Bradford and district.

British Engineers' Association.—A meeting of this Association was to be held at the Cutler's Hall, Sheffield, yesterday afternoon at which Mr. Douglas Vickers, the president, was to preside. He was to introduce the Association's Commissioner in China, Captain T. C. FitzHugh, M.V.O.

Re Foster Engineering Co., Ltd.—In the Companies Winding-Up Court on Tuesday, Mr. R. H. Burman petitioned for the compulsory winding up of this company. Counsel said that Mr. Justice Swinfen Eady had allowed the matter to stand over, with a view to the parties coming to an arrangement, and counsel now asked leave to withdraw the petition or to have it dismissed, the company to pay the costs. The petition was dismissed, the company paying the costs.

Institution and Lecture Notes.—Institution of Electrical Engineers (Scottish Local Section).—The annual report of the Committee states that the attendance at the general meetings remains unsatisfactory, the average attendance being barely 14 per cent. of the membership. Only two papers have been contributed from the Section. The past session was made memorable in the annals of the Section by the visit of the Institution to Glasgow during June last year. The membership of all grades now amounts to 390, an increase of 28. Commencing with January, 1914, the *Journal* will be published fortnightly during the session. The Council has in view a scheme for the better co-ordination of arrangements for selection and reading of papers in London and at the Local Sections. The office-bearers for the session 1913-14 will be as follows:—Chairman, Mr. J. A. Robertson; vice-chairmen, Mr. J. Lowson and Mr. T. Blackwood Murray; past chairmen (*ex-officio* members of Committee), Mr. Sam Mavor, Mr. F. A. Newington and Mr. W. M'Whirter; chairman of Students' Section, Mr. A. Page; ordinary members of Committee, Messrs. D. A. Starr, J. K. Stothert, J. F. Nielson, W. L. Spence, M. B. Field, J. H. Bunting, J. S. Nicholson, E. T. Goslin and G. Stevenson; hon. secretary and treasurer, Mr. J. E. Sayers; assistant hon. secretary, Mr. W. F. Mitchell. Hon. sec. of Students' Section, Mr. J. W. Mowat.

(London).—It is announced that the Institution does not hold a qualifying examination for admission as Student; but on and after June 1st, 1913, all candidates for election to the class of Students will be required to have one of the following qualifications:—

1. The Matriculation Examination of any University in the British Empire; or the Responsions Examination of the University of Oxford; or the Previous Examination of the University of Cambridge.
2. The Studentship Examination of the Institution of Civil Engineers.
3. The School-leaving Examination for the Scottish Education Department.
4. The Naval Cadet Passing-out Examination.
5. The Entrance Examinations for Woolwich and Sandhurst.
6. The School Examination (for School-leaving Certificate) or the Senior School Examination of the University of London.
7. The Oxford or Cambridge Local Examination. (A Senior Certificate, provided it covers English and Elementary Mathematics.)
8. The Oxford and Cambridge Higher Certificate (provided it covers English and Elementary Mathematics).
9. The Abiturienten Examination of any German or Austrian Secondary School, or the corresponding examination of similar schools in other countries.
10. The Certificate of any other Educational Authority which may be recognised by the Council of the Institution, as equivalent for the purpose of admission to the class of Students.

(London Students' Section).—The annual general meeting of this Section has been postponed from April 30th until May 7th. There are five extra-collegiate vacancies occurring on the Students' Committee, and nominations should be sent to the hon. secretary, Mr. E. T. Driver, 24, Bradgate Road, Catford, S.E., at the earliest opportunity. The next meeting will be held on Wednesday, May 7th, at 7.45 p.m., when Messrs. E. A. Richards and D. Dunham will read a paper on "Single-Phase Commutator Motors."

(Birmingham Section).—On Wednesday Dr. Gisbert Kapp read a paper entitled "On Phase Advancing," and gave a demonstration of his machine. The same paper was to be read in London yesterday.

(Yorkshire Section).—A paper was read by Mr. Sidney Simpson on "Prices Charged for Electric Power" at Sheffield on Wednesday, and a discussion followed.

Association of Mining Electrical Engineers.—At the monthly meeting of the West of Scotland Branch, held on Friday last at Glasgow, discussion was resumed on the paper read by Mr. James McCann, Carronhall Collieries, on "Coal-Cutting Machines; their Installation and Manipulation." Mr. Sydney F. Walker suggested that a motor-generator should be fixed in any convenient part of the pit to furnish current at 100 volts on the constant-current system. The 100-volt service would eliminate all chances of fatal shock, and the constant-current system obviated the necessity of a switch on the motor and any starting or regulating resistance. Everything was done by rocking the brushes, and this could be accomplished by gearing worked by a lever or wheel from outside the motor case, the shaft of the wheel or the gearing passing through a gas-tight gland.

The Society of Engineers.—On Monday, May 5th, at the Institution of Electrical Engineers, a paper on "Tidal Waters as a Source of Power" will be read by Mr. C. A. Battiscombe.

Concrete Institute.—Reports of the Reinforced Concrete Practice Standing Committee on "Cracks in Concrete," and "The Surface Treatment of Concrete," were read at the meeting on April 10th. The next meeting will take place on April 24th, when a report of the Science Standing Committee, entitled "A Standard Notation for Structural Engineering Calculations," will be presented.

For Sale.—The Paisley Corporation has for disposal one 300-kw. Ferranti steam alternator, five Ferranti rectifiers, and about 200 Wright's M.D. indicators. See our advertisement pages in this issue.

Inquiry.—Makers of the "Snap" patent lamp lock are asked for.

Appointments Vacant.—Shift engineer, for the Stretford U.D.C. Electricity Department (£2). Working electrical engineer and fitter, for the Axbridge Union (35s. +). Chief assistant electrical engineer, for the Watford U.D.C. (£150). Switchboard attendant, for the Borough Electricity Works, Lancaster (25s.). See our advertisement pages in this issue.

"The Generators."—The next dinner of the Generators will be held at the Trocadero, to-night (Friday).

Thirty Years' Celebration.—The Austrian Electrotechnischer Verein, of Vienna, recently held a special meeting to celebrate the completion of the thirtieth year of its existence.

OUR PERSONAL COLUMN.

The Editors invite electrical engineers, whether connected with the technical or the commercial side of the profession and industry, also electric tramway and railway officials, to keep readers of the Electrical Review *posted as to their movements.*]

Central Station Officials.—A pleasant little function took place at the Whitehall Club last Tuesday, when a number of personal friends entertained Mr. H. H. Couzens to dinner. The occasion was to mark the impending departure of Mr. Couzens to Canada, where, we understand, he will take up a very important position. Mr. John F. C. Snell acted as chairman. Mr. Blain, the tramways manager at West Ham, in proposing the health of the guest, referred in eloquent terms to Mr. Couzens's ability as an engineer and to his great capacity for friendship.

Mr. L. C. Gilmore, of the Maidstone Corporation electricity staff, has resigned, and joined the electrical department of Messrs. Drake & Fletcher, engineers, of Maidstone, who are extending this branch of their business.

Mr. R. Short, for several years second engineer in the employ of the Falmouth Electric Supply Co., has been presented by the staff with a pipe and case and tobacco pouch on the occasion of his departure to take up the position of chief engineer to North Berwick Electric Supply Corporation.

Mr. L. H. King, electrical engineer to the Whitby U.D.C., has resigned, having accepted the position of station erection superintendent with the Marconi Wireless Telegraph Co. He commences his new duties in three months' time.

Mr. T. A. G. Margary, mains superintendent of the Islington municipal electricity undertaking, has resigned his position.

The Leeds Tramway and Electricity Committee has decided to recommend the appointment of Mr. Charles N. Hefford as manager of the electricity department. Mr. Hefford was formerly assistant engineer in the department, and has been temporarily filling the position of manager since Mr. Harold Dickinson went to Liverpool. The Committee recommends that his commencing salary be £600 a year.

Mr. B. W. Gothard, engineer of the Minehead Electric Supply Co., Ltd., has been appointed electrical engineer to the Aldershot Gas, Water and District Lighting Co.

In order to show their appreciation of the manner in which their electrical engineer has carried out his duties, the directors of the Stratford-on-Avon Electricity Supply Co. have increased the salary of Mr. Julian G. Thain by £30, together with an allowance at the new rate on the salary he has received since he was appointed. It will be remembered that Mr. Thain was appointed in September last in succession to Mr. Falcke, who is carrying on private business at Mansion House Chambers, E.C.

The Taunton T.C. has appointed Mr. G. S. McClaren as mains and meter superintendent.

On leaving Ilfracombe for Grantham (Urban Electric Supply Co.), Mr. W. J. Copsey, who has been connected with the Ilfracombe E.L. Co. for several years, was presented by the engineer and manager, Mr. H. Stewart, on behalf of the staff, with a marble timepiece. He was also the recipient of marks of esteem from the members of the Ilfracombe branch of the C.E.M.S. and the Junior Imperial League. From the former he received a writing bureau, a badge of the society being affixed, and from the latter a silver hot-water jug.

Mr. William Wyld, M.I.Mech.E., M.I.E.E., borough electrical engineer and general manager of the Corporation Tramways, Birkenhead, has been appointed chief electrical engineer and manager for the borough of Hampstead. A native of Bishop Auckland, Mr. Wyld was educated at University College, Sheffield, where he studied mechanical and electrical engineering. He served his time to electrical engineering at Darlington, and his first appointment was as assistant in the Blackpool electricity works. From there he went as chief electrical assistant to Salford. Later, he moved to Wednesbury, and worked for the Patent Shaft and Axletree Co. He designed the electrical station there, and also fitted up the machinery for providing power and light. He was afterwards appointed electrical engineer at Doncaster, where he superintended the construction of the tramways. In 1904 Mr. Wyld went to Birkenhead, succeeding Mr. Fearnley, who went to Sheffield. On Mr. Bate leaving Birkenhead in 1907, Mr. Wyld was appointed to the dual position of electrical engineer and tramway manager, and he has been responsible for many important improvements in the Birkenhead undertakings. He is a member of the Liverpool Engineering Society, and was last year on the Council of the Tramways and Light Railways Association. In his new post, Mr. Wyld may rest assured that he will have the best wishes of everybody.

General.—At a *café chantant*, held last Monday at the Chiswick Town Hall, Mr. A. H. Stanley occupying the chair, the staff of the London United Tramways, Ltd., presented Mr. Z. E. Knapp, who recently retired from the post of general manager to take up the position of chief engineer of the Underground Electric Railways of London, with an illuminated address and a gold watch, and Mrs. Knapp with a gold chain purse. In making the presentation, Mr. J. B. MacKinnon, traffic superintendent of the L.U.T., said the whole staff were eager to testify to the happy relationship that had existed since Mr. Knapp took office in 1910, and of the sense of justice, and the sympathy and generosity he had always displayed in matters affecting their well-being, and particularly with respect to the improvement in their conditions of employment. Mr. Knapp, in response, said the one change during his short period of office that gave him the greatest satisfaction was the introduction of the so-called "educational" system. The old method of disciplining men by suspension did not work well. Under the new method of merit and demerit marks a man was disciplined without the consequences reacting upon those who were dependent upon him. He had to thank the directors and the staff for all the consideration extended to him, and neither he nor his wife would ever forget their kindness, which had found a lasting expression in the handsome presentations that evening.

Congratulations to the Manchester Association of Students (in connection with the Institution of Civil Engineers) on the choice of its new president—Mr. S. L. Pearce, city electrical engineer of that city.

The *British Australasian* says that Mr. G. T. Milne, who takes the place of Mr. Hamilton Wickes as H.M. Trade Commissioner in Australia, has arrived in Fremantle.

Obituary.—Mr. Dacre Helme.—We deeply regret to record the death, which occurred last Friday, following upon pneumonia, of Mr. Dacre Helme, borough tramways manager and electrical engineer at Nelson. Mr. Helme went to Nelson in 1904, having previously been associated with Messrs. Vickers, Maxim and Co., Barrow, and entered the service of the Corporation as a mechanical fitter and electrical engineer. When Mr. Henry was promoted, Mr. Helme was made chief assistant engineer, and on the tragic death of Mr. Henry in 1906, he was chosen chief electrical engineer and tramways manager. When Mr. Helme took over the concern, it was in a poor way financially, but, as a result of close study of the needs of the town and zealous efforts to cater for them, he had the satisfaction 12 months ago of announcing that the two departments had actually made a profit. Mr. Helme, who is described as a painstaking official, was a native of Hereford, and only 39. He leaves a widow and one son. The funeral took place at Little Marsden on Tuesday, and was attended by a large gathering, including the Mayor, Corporation officials and members of the Town Council.

Mr. John Saxby.—We regret to learn from yesterday's newspapers that Mr. John Saxby, whose name has for many years been well known by reason of his inventions in connection with the interlocking of railway points and signals, passed away on Wednesday, at Hassocks, near Hayward's Heath. His firm, Messrs. Saxby and Farmer, Ltd., of Westminster, which has all along specialised chiefly in railway signalling inventions and work, is one of the oldest associated with British electrical industry. He was in his 92nd year.

Mr. R. Coates.—The *Western Mail* reports a fatal accident having occurred on Saturday at Ystradgynlais, to Mr. R. Coates, manager of the electric light works of the Glantawe Electric Supply Co., Ltd. "No one witnessed the accident, but his body was discovered in the engine-house about 8.15 p.m. terribly mutilated, after having been whirled round by a fly-wheel. The unfortunate man's head was jammed in the machinery. Mr. Coates was 38 years of age, and he leaves a widow and four children."

An inquest was held on Tuesday. It was stated that deceased was at the works when he asked a man named George Harris to attend to the boilers. Harris proceeded to do so, and on returning found the manager's dead body near the fly-wheel badly mutilated and lying across the column. It was supposed that the deceased's clothing caught in the machinery, and that he was whirled to death. Dr. Walsh said that the body was badly injured, and before it could be extricated from the machinery it was found necessary to sever one of the hands. A verdict of "Accidental Death" was returned, and the Coroner said he had written to the company suggesting that there should be more protection of the machinery.

Mr. T. A. Tisseman.—The death occurred at Warminster (Wilts.), on April 14th, of Mr. Thos. Alfonsus Tisseman, who, after serving his articles with Messrs. Crompton & Co., of Chelmsford, received the appointment of electrical engineer to Messrs. C. A. Vandervell & Co., of Acton Vale. Deceased, who had been ill for some time, was only 25 years of age.

J. R. Hazeldean.—The death has occurred of Mr. John Roberts Hazeldean, Tor Terrace, Newquay, electrical engineer, at the age of 57. Mr. Hazeldean expired shortly after retiring to rest.

NEW COMPANIES REGISTERED.

G. St. John Day (Patents), Ltd. (128,154).—This company was registered on April 4th, with a capital of £10,000 in £1 shares to take over from G. St. John Day, of Mumps Electrical Works, Oldham, the benefit of two patents relating (1) to electrical coupling devices, and (2) to improvements in the conjunction of cords or wires with electrical apparatus, and of two other inventions known as the "One-part Lampholder" and the "Mumps Lampholder." The subscribers (with one share each) are:—G. St. John Day, 303, Park Road, Oldham, electrical engineer and contractor; J. Orme, 91, Queen's Road, Oldham, engineer; W. Chadwick, Haslemere, 89, Queen's Road, Oldham, solicitor. Private company. The number of directors is not to be less than two or more than four; the first are G. St. John Day, J. Orme and W. Chadwick, each of whom may retain office while holding 600 shares. Registered office, Mumps Electrical Works, Albert Street, Oldham.

Premier Electric and Hardware Co., Ltd. (128,030).—This company was registered on March 29th, with a capital of £2,000 in £1 shares to carry on the business of electricians, electrical engineers, generators and storers of electricity for motive power, light and heat, hardware merchants, &c., and to acquire the business carried on at 9/11, Cheapside, Golder's Green, as the Premier Electric and Hardware Co. The subscribers (with one share each) are:—G. Cohen, 9-10, Cheapside, Golder's Green, N.W., electrician; J. MacConnell, Old Serjeants' Inn Chambers, W.C., auditor. Private company. The first directors are not named. G. Cohen is first secretary. Registered by J. MacConnell, Old Serjeants' Inn Chambers, Chancery Lane, W.C.

Electric Cookers, Ltd. (128,070).—This company was registered on April 1st, with a capital of £5,000 in £1 shares (3,000 preference) to take over certain inventions relating to electric cookers, &c., and to adopt an agreement with H. T. Harrison. The subscribers (with one share each) are:—C. A. Battiscombe, 120, Victoria Street, S.W., civil engineer; H. T. Harrison, 11, Victoria Street, S.W., electrical engineer. Private company. The number of directors is not to be less than two or more than five; the first are C. A. Battiscombe (managing director) and H. T. Harrison. Registered by Jones, Son & Andrews, 54, New Broad Street, E.C.

Reversible Turbines, Ltd. (128,167).—This company was registered on April 4th, with a capital of £1,912 10s. in 1,750 "A" shares of £1 each, and 3,250 "B" shares of 1s. each, to acquire from W. G. Walker his invention for a reversible turbine engine, and benefit of patents or other protection in respect thereof. The subscribers (with one share each) are:—H. W. McBean, 172, Wilbury Road, Letchworth, Herts., secretary; W. A. Stephenson, Loch Inch, Streatham Park, S.W., secretary; A. E. Whittock, 40, Horder Road, Fulham, S.W., clerk. Private company. The number of directors is not to be less than two or more than five; the subscribers are to appoint the first. Registered by M. L. Knight, Bromley, Kent.

Castlecomer Tramway Co., Ltd. (3,963).—This company was registered in Dublin on April 3rd, with a capital of £40,000 in £1 shares, to promote, construct, equip and work, by steam, electric or other power, a tramway or light railway in Castlecomer, Co. Kilkenny. The subscribers (with one share each) are:—R. H. Prior-Wandesforde, D.L., Castlecomer House, Castlecomer; J. H. Marr, "Coobawn," Castlecomer, mining engineer. Private company. The first directors, to number not less than two or more than five, are R. H. Prior-Wandesforde, R. B. Gahan and J. H. Marr; qualification, £10; remuneration as fixed by the company. Registered office, Castlecomer, Co. Kilkenny.

W. Leonard & Co., Ltd. (128,187).—This company was registered on April 5th, with a capital of £500 in £1 shares, to take over the business of an electrical engineer carried on by W. Leonard Prangnell, at 4, Soho Street, W., as "W. Leonard & Co." The subscribers (with one share each) are:—W. L. Prangnell, 4, Soho Street, W., electrical engineer; A. E. Rule, 4, Soho Street, Oxford Street, W., accountant. Private company. The number of directors is not to be less than two or more than five; the first are W. L. Prangnell and A. E. Rule, secretary. Registered office, 4, Soho Street, Oxford Street, W.

National Engineering Co., Ltd. (128,180).—This company was registered on April 5th, with a capital of £25,000 in 12,000 preference shares of £1 each, and 26,000 ordinary shares of 10s. each, to acquire from Otto Viola the business known as the National Engineering Co., for £19,000 (£6,500 in preference shares and £12,500 in ordinary shares), and to carry on the business of general and electrical engineers, &c. The subscribers (with one share each) are:—A. Winder, 43, Addison Way, Hendon, N.W., engineer; E. Brown, 13, Alperton Street, Paddington, W., engineer; W. Jebbitt, 80, Manor Street, Clapham, S.W., engineer; J. White, 46, Wharton Street, King's Cross Road, W.C., engineer; S. Gozzett, 3, Harlington Road, Grove Park, Chiswick, W., engineer; D. Murphy, 139, Stanhope Street, N.W., engineer; W. Nichols, 512, High Road, Chiswick, W., engineer. Registered without articles of association. Registered office, 30-32, Seaton Street, Euston Road, N.W.

Zephyr Ventilating Co., Ltd. (128,319).—This company was registered on April 12th, with a capital of £7,500 in £1 shares, to take over the business of a ventilating and general engineer, carried on by H. C. H. Tarr at Zion Road, Lawrence Hill, Bristol, as the "Zephyr Ventilating Co.," to acquire from J. S. Armstrong and H. C. H. Tarr a certain patent, to carry on business of manufacturers of wires, cables and electrical appliances, electric and general engineers, &c. The subscribers (with one share each) are:—J. Liddell, 46, Queen Square, Bristol, manufacturers' agent; J. Armstrong, 9, Elmgrove Road, Bristol, sugar merchant. Private company. The number of directors is not to be less than two or more than six, the first are H. C. H. Tarr and J. Liddell; solicitor, J. McTurk, 31A, Corn Street, Bristol. Registered by Jordan & Sons, Ltd., 116-117, Chancery Lane, W.C.

"Ceag" Electric Safety Lamp Co., Ltd. (128,191).—This company was registered on April 7th, with a capital of £10,000 in £1 shares (2,500 7½ per cent. cum. preference), to carry on the business of manufacturers, importers, and exporters of and dealers in electric lamps and all kinds of electric or mechanical accessories, tools, implements and articles, &c. The subscribers (with one share each) are:—C. E. von Bernard, 62, Queensborough Terrace, W., gentleman; W. Strecker, 23, St. John's Wood Park, N.W., music publisher; M. J. Stoeck, 19, St Dunstan's Hill, E.C., merchant; T. H. Engelmann, 19, St. Dunstan's Hill, E.C., merchant. Private company. The number of directors is not to be less than two or more than five; the first are C. E. von Bernard, W. Strecker (chairman), M. J. Stoeck and T. H. Engelmann; remuneration of chairman £50 per annum. Registered by Cruesemann & Rouse, 35, Gracechurch Street, E.C.

CITY NOTES.

Lancashire Power Construction Co., Ltd.

The directors' report for the year ending December 31st, 1912, states that the contract for a 3,500-kw. generating set for the Lancashire Electric Power Co. has recently been completed, and the set is now doing regular work. The load of the Parliamentary Co. is, however, continuing to increase at such a rapid rate that still further plant is required; an order has, therefore, been placed with this company for a generating set with a normal full-load capacity of 4,375 kw., and this set is due for delivery in September next. In order to provide the necessary capital for this plant, and also for various extensions of the mains, it is proposed to make an issue of £100,000 of 5 per cent. prior lien bonds, making with the £50,000 issued in June, 1911, a total issue of £150,000.

The trading profit of the Lancashire Electric Power Co. for the year 1912 has amounted to £14,617. This figure would have been considerably larger but for loss of revenue and increased expenditure as a result of the coal strike. The company's supply was kept intact throughout the period of the strike, but the loss in output was very considerable, and it is estimated that the profits were adversely affected to the extent of £1,380. There was also a strike in a branch of the textile trade in the early part of the year, which also made itself felt on the output of the company. To the trading profit has to be added £757, being interest on the hire-purchase instalments, &c., making a total of £15,374; out of this debenture interest requires £4,500, debit balance written off £7,737, and there is to be carried forward £3,137. The debit balance which appeared in the 1909 balance-sheet of the company as £17,194 has now been eliminated. Notwithstanding the troubles referred to above, the company's business has continued to develop in a most satisfactory manner, as the following figures indicate:—

	1908.	1909.	1910.	1911.	1912.
Units generated	7,181,793	9,251,831	13,646,307	17,771,936	23,110,807
Max. load in kw.	2,890	3,820	4,690	5,590	6,730
H.P. connected	5,960	7,710	10,600	13,600	16,400
Receipts	£10,056	£15,294	£24,952	£32,726	£42,773
Expenditure	£14,421	£15,164	£18,467	£22,031	£28,156
Trading result	£4,365 Loss.	£130 Profit.	£6,485 Profit.	£10,695 Profit.	£64,617 Profit.

The receipts from the low-tension general supply, which the company is operating in certain districts, continue to grow rapidly, and two more districts will be developed during the present year. The new contracts arranged for and which will come into operation this year are some of them of a most important description. Amongst others may be mentioned, as being of a public character, the agreements to supply electricity in bulk to the Corporation of Salford and to the urban district of Hindley, and the contract for the Lancashire and Yorkshire Railway electrification between Bury and Holcombe Brook. In the weaving trade the system of driving each loom by a separate motor (a system in which the company were pioneers) continues to make rapid progress, and two new mills at present in course of erection in the company's area, and which are to be supplied with electrical energy from the company's mains, are both being equipped in this manner.

The prospects for the current year are excellent, provided that no labour troubles occur to dislocate trade. The amount of work in hand at the commencement of the year, exclusive of the Salford contract, which had not then been entered into, and which is not likely to become effective before the autumn, was considerably in excess of the amount of work in hand at the commencement of 1912. It is true that the price of coal has risen some 20 per cent., but, owing to the provision of a coal clause in the company's agreements, this will not affect the company's profits to any serious extent. A marked improvement in the company's position as a result of the year's trading is, therefore, confidently anticipated.

Dr. H. F. Parshall, chairman, presided on April 17th at Salisbury House, E.C., over the annual meeting, and in moving the adoption of the above report, he said that the balance-sheet, whilst satisfactory, might not show the progress of the business during the year, because that company was a holding company, and it was the progress of the Parliamentary Co., viz., the Lancashire Electric Power Co., which was of most interest. The connections of the Parliamentary Co. during 1912 totalled 2,102 kw., as against 2,107 kw. connected during 1911, and the work in hand, but not connected at the end of the year, totalled 2,404 kw., as compared with 1,922 kw. at the end of 1911. Since the commencement of the year, the Salford contract had been arranged, and it was anticipated that the effect on this year's load would be to add 1,000 kw. or 1,500 kw. to the normal growth. The price had been very carefully worked out, and would bring a very substantial profit to the Lancashire Co., whilst it appeared to be an eminently satisfactory contract to the Salford Corporation. The units sold increased from 14,081,000 in 1911, to 18,815,000 in 1912, which was the greatest increase for one year that the company had ever experienced. The percentage increase was 33·6. During the same period the revenue increase from £32,150 to £42,776, while the trading profit increased from £10,695 to £14,617. The latter figure would have been considerably higher but for the coal strike, which lasted for six weeks, and which it was estimated affected the profits of the company to the extent of £1,380. All their contracts contained a clause to protect them against a general increase in the price of coal, but of course during the transition period they did not get the advantage of the clause. A further unsatisfactory feature was the breakdown of one of the generating machines, but the cost of repairing this had been borne out of the revenue account. There was also a strike in the weaving trade, which also, to a small extent, adversely affected the returns. The units sold from the low-tension system increased from 202,731 to 318,839, or rather over 50 per cent. The capital expenditure had been considerable owing to the power station extension, the total expenditure for the year being £63,844, of which approximately £45,500 was spent on buildings and plant at the power station; £3,795 on sub-station equipment; £8,985 on high-tension mains; and £5,500 on provisional orders. He did not see why the result during the present year should not be as good, as the amount of work in hand was greater than they had a year ago, whilst last year also they had no such important business as the Salford contract to look forward to.

Mr. F. E. Gripper seconded the motion.

Mr. Crossway asked whether it was possible to have a profit and loss account of the Parliamentary Co.

The Chairman explained that they were the holding company, and found the money for the construction work of the Parliamentary Co., and the latter company issued securities to the holding company for the work done by them. This was the turning point of the company, because the Parliamentary Co. now being solvent, they would be free to pay dividends.

The report was adopted.

The Chairman said the Parliamentary Co. had several important supply contracts with people like the Lancashire and Yorkshire Railway Co., which might increase very rapidly, and so in order to be prepared they proposed to issue the balance of the prior lien bonds, £50,000 had already been issued, and there were £100,000 unissued. He had received an offer to take up the bonds, and most of the present holders of prior lien bonds whose consent was necessary to the new issue and to the terms, thought the proposed arrangement would be a fair one, because the additional money would enable the company to earn a very substantial profit. He mentioned the matter, but it would have to be brought before a special meeting to be called.

Answering Mr. Crossway, the Chairman said that any shareholder could have the bonds on the same terms as the group who were prepared to take them up.

The retiring directors and auditors were re-elected.

Re Durham Collieries Electric Power Co., Ltd.

Sitting for the disposal of company's business, Mr. Justice Neville, on Tuesday, April 22nd, heard a petition by the Durham Collieries Electric Power Co., Ltd., a summons in the debenture-holders' action of Poole *v.* The Company, by which the Court was asked to sanction a conditional agreement for sale of the company's assets to the Newcastle Electric Supply Co., Ltd., and the distribution of the purchase price amongst the debenture-holders of the Durham Co. Mr. H. E. Wright, who appeared in support of the application, said that the sale the Court was asked to sanction, was of the whole of the Durham Co.'s property and undertaking for 10,000 fully-paid shares of £5 each, and the scheme was for the distribution of those shares upon a certain basis amongst the holders of the debentures in the Durham Co. The Durham Co. had issued both debentures and prior lien bonds, and the Newcastle Co. held a large proportion of both, but, with regard to the prior lien bonds, the Court would not be troubled, as in so far as they were not held by the Newcastle Co., it was part of the agreement that that company should pay them off. Some £8,500 were held as collateral security for a debt of £3,500, but the whole of that was to be satisfied as part of the arrangement. The trustee for the debenture-holders made some claim for remuneration, and although that was not provided for by the agreement, he had a letter from the Newcastle Co. that they would pay what was demanded. The total debenture issue was £193,280, a large part of which were held by the Newcastle Co. and surrendered as part of the purchase consideration. In 1912, the Durham Co. went into voluntary liquidation, a receiver was appointed in the debenture-holders' action, judgment pronounced, and a certificate obtained. The agreement for sale was conditional on the sanction of the Court being obtained, and, on its being completed, the Court was asked to sanction a distribution of the 10,000 ordinary shares amongst the existing debenture-holders in the Durham Co. *pari passu*. To avoid having fractional certificates where the amount of debentures held would not permit of an even allotment, the trustees were to have power to sell and distribute in cash. The proposal was approved at the meeting by a large majority of debenture-holders the amount of £141,510 voting in favour and only one (the holder) for £200 voting against, Mr. Spens on behalf of the holder of debentures to the amount of £1,370 now opposed the application. He was not prepared then, he said, with evidence, but asked for an adjournment, so that he might ask that the Durham Co. might be wound up compulsorily. The ground was that for years this company had been worked by the Newcastle Co. for their own benefit.

His Lordship said that the opposition on that ground came too late, and sanctioned the sale and distribution at purchase price, as proposed, subject to the debts to be discharged by the Newcastle Co. being specified in the order.

West India and Panama Telegraph Co., Ltd.—A dividend of 1s. per share on the ordinary shares is announced.

Cuba Submarine Telegraph Co., Ltd.—Dividend on ordinary shares for the half-year ended December, 1912, at the rate of 6 per cent. per annum.

North Metropolitan Electric Power Supply Co.

The directors' report states that, for the year ended December 31st, 1912, the revenue amounted to £142,962, an increase of £10,087 over 1911, and the expenditure was £71,628, being £10,948 in excess of the previous year, of which £7,483 is due to the increased output, referred to below, and the balance to the higher price of coal. The balance at the credit of the account is £71,334. This, together with interest and dividends receivable and the amount brought forward, makes a total of £80,773. After providing for mortgage, loan and debenture interest, transferring £2,000 to the reserve fund, and placing £25,000 to depreciation account, the directors propose to pay the dividend on the 6 per cent. cumulative preference stock and a dividend at the rate of 6 per cent. per annum, together with a bonus at the rate of 8s. per fully paid share, on the ordinary shares, leaving £1,820 to be carried forward. The capital expenditure during the year amounted to £50,670, making the total £666,018. In June, 1912, a further issue of 6 per cent. cumulative preference stock was offered to the ordinary share and preference stockholders and taken up. The third instalment of £25 per cent. was called up in February, 1913, and the final instalment is payable this month. The directors propose at an early date to make a further issue of 5 per cent. mortgage debentures. The total number of units sold was 29,231,099, an increase of 2,776,607 units, or 10·5 per cent. The supply of electricity was maintained without cessation throughout the period of the coal miners' strike, although some weeks after the commencement of the strike, the company thought it desirable to urge economy in the use of the supply for traction purposes, and by authorised distributors and the larger power users. The output and revenue were, in consequence, adversely affected, and the costs for the year show an increase owing to the higher price of coal. The building and plant extensions in connection with the Brimsdown power station are nearly completed, whilst the Willesden power station extensions are still proceeding. Considerable extensions of the Hertford power station will be made at an early date in order to meet the demand for electricity for power purposes in that district. A supply of electricity has been commenced in the district of Hadley, and during the present year arrangements will be made to extend the supply to East Barnet. The total connections to the mains of the North Metropolitan Electrical Power Distribution Co, Ltd., the capital of which is held by this company, have increased by 13·9 per cent., and a dividend at the rate of 6 per cent. has been paid by that company in respect of the past year.

Indian Electric Supply and Traction Co., Ltd.

The annual meeting of this company was held on Monday at the offices, Orient House, New Broad Street, E.C., Mr. John B. Stone presiding.

The Chairman, in proposing the adoption of the report, said that as they were aware, the £48,296 of 3-year debentures fell due for repayment on December 31st last. The majority of the debenture-holders who subscribed to assist the company at a critical period were not prepared to renew. It became necessary, therefore, to arrange for an issue of long-dated debentures to repay these and to provide further funds for development. He was glad to say that the board were successful in placing an issue of £60,000 20-year debentures, and the company was, therefore, free from anxiety in this respect. Referring to the progress of the undertaking, he was glad to say that the sales of current had risen from 813,204 units to 1,189,892, and the gross receipts were £13,572, as against £10,974 last year. The connections to the mains expressed in the equivalent of 33-watt lamps were 45,507, as against 28,739 in 1911. The demand for current for power purposes increased at a greater rate than that for lighting, and must continue to do so in a city such as Cawnpore, and considerable expansion in this direction might be looked for in the current year. They might also expect some extension of the municipal lighting. The cost of generating had risen from 1·03d. to 1·07d. per unit, owing to the increased cost of coal. Contracts for a large proportion of their requirements for 1914 had been arranged. The profit was about £500 less than was anticipated, due to the higher cost of coal, and certain expenses connected with the debenture issue, which the board had decided should be charged against revenue. The sales department showed a profit of £906, as against £600 in 1911. The expansion of the business had justified their proceeding with the installation of condensing plant, and this was in course of erection, and with the economiser which was being shipped, a substantial saving in coal consumption should be effected. They were also erecting a plant for cooling the water for condensing, and a brick chimney, which had been found advisable for the increased boiler power. These additions and improvements would cheapen the cost of production, and their effect should be felt in the latter part of this year. The new plant included a fifth boiler, which was being erected, and a 600-kw. generating set. The latter was purchased from the Government, after it had run efficiently for a few weeks at Delhi during the Durbar. They estimated that there was a saving of over 30 per cent. on this purchase as against the same plant being bought at home, shipped to India, and thence taken by rail to Cawnpore. The tramway earnings of 5d. per car-mile compared with 4·62d. last year, but costs were 4·90d., against 4·02d. Of the increase ·15d. was due to track rent. The board had hoped that in view of the unremunerative nature of the tramway enterprise, the municipality might have remitted the track rent, and the latter had partly met the company by reducing the amount from Rs. 5,508 per annum to Rs. 2,451, which sum was included in the accounts. The chairman expressed the board's appreciation of the work of the staff in Cawnpore and the improved results that had followed.

Mr. Scott Moncrieff, in seconding the motion, said that when he first met the shareholders of the company in 1909, the board had to report a loss of £9 on the year's working. The revenue in that year from the sale of current, and from the working of the tramways was £6,750. They now came before the shareholders with a revenue of £17,435, and the £9 loss had been converted into a profit of £8,432. Those figures showed that there was a great deal of life in the company, and that was what he told them four years ago. In 1909 their output amounted to 131,000 units sold to the public. It was now nearly ten times that amount, but the revenue per unit had fallen from 4·65d. to 2·33d. That fall in the price really was a good sign, because it indicated a large increase in the company's business as suppliers of power. He had told them in the past that they looked to a great increase in the business in Cawnpore from the supply of power, not only for large mills, but for medium-sized industries in the city. The figures received from Cawnpore for last year's increase showed a total of 454 H.P. in motors connected to the mains, and only half of that was accounted for by one large mill; the balance was divided among flour mills and engineering works, oil mills, &c. It was important to notice that they kept spreading out amongst those various industries, and that was a strong feature about the business. Another matter which had occupied the attention of the board last year had been the improvement of their plant in Cawnpore. Up till recently they had been crippled in this respect, owing to insufficiency of funds, and they had been forced to adopt a very conservative policy. Last year they had the benefit of a visit to England of their chief engineer, and, although he was home on holiday, he devoted a good deal of his time to getting out the scheme for introducing the condensing plant, to which the chairman had referred. They looked forward to considerable benefit from the use of that plant, although it would not be in active use until the latter part of this year.

The report was adopted.

United River Plate Telephone Co., Ltd.—The directors' report that the gross receipts in sterling for the nine months to December 31st in the River Plate were £400,068. Deducting expenses in Argentine and London, debenture interest and dividend on preference shares, and adding interest on investments, transfer fees, &c., and the sum of £5,492 brought forward from the previous year, there remains an available balance of £110,574. The estimated revenue charge required to provide systematically for future renewals of plant has, as before, been added to the item maintenance in the profit and loss account, and credited to reserve for renewal of plant, and all special replacements carried out during the period covered by the accounts have been debited to this reserve. The directors recommend that a dividend be paid for the nine months at the rate of 8 per cent. per annum, free of income-tax, that £2,000 be placed to the staff's provident fund, £30,000 to the reserve fund account, and that £5,804 be carried forward. To provide for the steady and gratifying growth of the business a new issue of 54,000 ordinary shares will be made forthwith to the ordinary shareholders at the price of £5 10s. per share.

I.W. Electric Light and Power Co., Ltd.—The annual meeting was held recently at Ryde. Mr. F. E. Gripper presided, and it was reported that the equivalent of nearly 10,000 additional lamps had been connected during the year, the largest increase being at Newport and Cowes. The profit from sale of current had increased by £500. After paying interest on debenture stock and the dividend on the preference shares there was a balance of £9,300, £1,685 more than last year. The directors recommended that £3,500 be placed to reserve for the renewal of plant and £1,000 to the ordinary reserve account. They also recommended that a 2 per cent. dividend be paid on the ordinary shares, requiring £2,000, and that £2,779 be carried forward.

Montreal Light, Heat and Power Co.—The directors have declared a dividend of 2¼ per cent. (at the rate of 9 per cent. per annum) for the quarter ending April 30th.

Stock Exchange Notices.—The Committee have ordered the undermentioned securities to be quoted in the Official List:—

Calgary Power Co., Ltd.—Further issue of £48,900 5 per cent. 30-year first mortgage bonds of £100 each (Nos. A 4,112 to 4,600).

Empire District Electric Co.—$2,921,000 first mortgage 5 per cent. sinking fund gold bonds of $1,000 each (Nos. 1 to 2,921).

Electrolytic Alkali Co., Ltd.—At the meeting held at Liverpool last week, there were some opposition to the resolution for voluntary liquidation, but after lengthy discussion it was carried on a poll.

Brazilian Traction, Light and Power Co.—A dividend of 1½ per cent. is announced.

Kaministiquia Power Co.—The directors have declared a dividend of $1¼ per share (at the rate of 5 per cent. per annum) for the quarter ending April 30th.

Held Over.—Owing to heavy demands upon our space this week, we are compelled to hold over several reports of companies until next week.

Direct United States Cable Co., Ltd.

The directors' report for the year ended March 31st, 1913, states that the reserve fund account shows a balance of £487,474, as compared with £509,128 at March 31st, 1912, a decrease of £21,655, which is accounted for by expenditure in connection with the repair of the main cable in mid-Atlantic in June, 1912. The directors regret that the main cable has been again interrupted in deep water in mid-Atlantic. The cable ship *Dacia* has recently left London for the position, and will at once proceed with the repair. Three quarterly interim dividends of 2s. each per share (less income-tax), amounting to £34,301, have been declared and paid during the year, and a final dividend of 2s. per share (less tax) is now proposed, making a total distribution of 4 per cent. for the year. After providing a further £10,000 as provision for depreciation of investments, the balance of revenue, £20,104, is transferred to the reserve fund account.

The annual meeting takes place on April 29th.

Anglo-Argentine Tramways Co., Ltd.

The annual meeting was held on Monday at Winchester House, E.C., Mr. J. B. Concannon presiding.

The Chairman, in proposing the adoption of the report (see Electrical Review, page 653), after referring with regret to the death of Mr. Hector Monnon, one of the directors, said he was pleased to say that the business of the company continued to progress. They operated 330 miles of single track, as against 333 in the previous year. The number of passengers carried was 316,260,077, being 17,105,242 in excess of those carried in 1911. The gross receipts for 1912 were £2,778,302, an increase of £146,466. On the expenditure side, wages were £55,360 more, due mainly to their cars having run an additional 1,757,000 miles, and partly to higher wages and shorter hours. Cost of materials increased by £17,737, owing to heavier work on maintenance, and taxes, consequent upon increased receipts, were £20,792 more. On the other hand, they had the pleasing fact that, whilst the cost of current per unit was very high, owing to dearer coal and freight, and although their cars ran 1,757,000 more miles, they had been able, thanks to improved methods, to effect a considerable reduction in the number of units consumed, resulting in the charge under this head showing a decrease of £6,702. With normal prices for coal and its freight to Buenos Ayres, the saving would have been about £39,400. The net increase in expenditure worked out at £85,093 and the increase in gross profit at £61,373. The large total of £455,471 was expended upon maintenance and renewals during the year under review, necessitated by the board's policy of keeping up the property in a high state of efficiency. The amounts at credit of net revenue, including £10,946 carried in from 1911, after placing £135,000 to credit of depreciation funds, was £954,261. The annuity payable to the City company, debenture charges, dividends on preference shares, and the various sinking funds, absorbed £755,922, leaving a balance at credit of net revenue account of £209,306. An interim dividend of 4 per cent. had been paid upon the ordinary shares, and they now recommended a further dividend of 4¼ per cent., making 8¼ per cent. for the year, as against 7¾ per cent. for 1911, leaving a balance of £9,254 to be carried forward. It was gratifying that they were in a position to propose an increased dividend on the ordinary shares, more particularly as the prior charges in 1912 showed an increase of £28,365 over those for 1911. The investments stood at £316,279, which was the cost price. On the other side they had an investment depreciation reserve fund of £9,131. Since the latter account was created, he regretted to say that there was a further depreciation amounting on December 31st last to about £12,000. They had not had to realise any of those investments, all of which were of the class that used to be described as "gilt-edged." Should they have occasion to sell, their ordinary reserve fund, which amounted to £66,013, would, of course, be available to meet the further depreciation, if any. A shareholder had written commenting upon the item £814,173, "discount and commission on issues of debenture stocks," figuring on the asset side of the balance-sheet, and suggested that it should be written off out of the profits. This, as he explained at the meeting two years ago, was being done by operation of a sinking fund. £515,292 of the amount represented the difference between the sale price and par of the 4 per cent. debenture stock, and £146,630 the bonus given to the old 6 per cent. debenture stock on their converting into 4½ per cent. debenture stock. Already £98,832 of these two stocks had been purchased in the market and extinguished. The balance of this item amounting to £253,330 refers to the 5 per cent. debenture stock, the sinking fund for the redemption of which would commence in 1916. The whole of the 4 per cent. debentures which involved an annual charge against revenue of £178,626 would be extinguished 22 years before the expiration of the concession, and the 4½ per cent. and 5 per cent. stock would be paid off a few years before that event. For the current year the receipts up to the 15th inst. showed an increase of £60,267, whilst the net profits to March 31st had also increased by £25,159. On the other hand, the debenture service for this year would absorb an addition of about £70,000. On the whole although many of the services continued to be adversely affected by the construction of the subways, they anticipated satisfactory results for the complete year, and they looked forward with interest and confidence to the opening of the first subway section towards the end of this year. In view of the general manager's statement, which was embodied in the report, he need not detain them much longer, but he must refer to the possibility of competition from motor-omnibuses. He should not have thought it necessary to do so but for the fact that reference had been made to the subject in some of the newspapers, prompted, no doubt, by the success attained by motor-omnibuses in London. Now the conditions in London were quite different from those prevailing in Buenos Ayres. In London, as they all knew, the tramways did not penetrate the most important business centres either in the city or in the West End, whereas the omnibuses did, and very good use they made of the advantage both from their own and the public point of view. In Buenos Ayres, however, practically every street leading from the suburbs to the business and shopping centres of the city was traversed by tramways, and everyone acquainted with Buenos Ayres was aware that those streets were so narrow and congested that there was not sufficient space for their cars to pass each other, so that the cars inward and outward bound had to run over parallel streets. The problem of relieving this congestion was always occupying the attention of the municipal authorities, and it seemed very unlikely that they would permit the introduction of omnibuses, but assuming that they did, he was pretty confident that they would not compete successfully with their surface cars, and they certainly could not with their combined surface and subway systems. In conclusion, he might add that he was not aware of an omnibus company in this or any other country which was profitably worked in competition with a tramway company whose services tapped all the available sources of traffic.

Mr. T. Frame Thomson, in seconding the motion, said it was interesting to notice how the extraordinary development of the city transportation of Buenos Ayres had followed the development of the tramway system. There had not been a retrograde step in the development of tramways in the city since their first introduction. As regards the question of motor-omnibus competition, there was no parallel between Buenos Ayres and London. London was one of very few cities in the world where up to a point omnibus travel was universal, and it was only within recent years that tramways had been used to any appreciable extent in London. In other big cities of the world it was exactly the reverse. For instance, in New York, the people had acquired the tramway habit and they held to it, and there was only one avenue where motor-omnibuses ran. In Buenos Ayres, the tramways were the first system of transport, having commenced running in 1868, and there never had been any other system, and as the chairman had said, the roads were too narrow to allow of it.

Mr. Hamilton, K.C., remarked that he was in Buenos Ayres last September and went over the whole of the company's system, and he agreed with the chairman and the vice-chairman that motor-'bus competition was entirely out of the question. No sane body of people would provide the necessary money for such a service, as the streets were entirely occupied by their tramways—in fact, the streets were so narrow that he doubted whether motor-'buses would be able to get down them. He would like to know whether it was proposed to enable a further issue of capital, and if so, what form it was likely to take.

The Chairman, in reply, said that at present they had one and a half million of unexpended capital, but with the heavy work they were doing on the subways that would not last very long. They had not settled anything definite yet, but they were considering with the Continental directors the advisability of postponing a further issue of debenture for a year or two, and placing instead the balance—one and a half million of the ordinary share capital.

The report was adopted.

Official Announcements re Companies. — The following companies will, unless cause is shown to the contrary, be struck off the register within three months, and will accordingly be dissolved :—

British India Mica Co., Ltd.
Chameleon Signs, Ltd.
Dynelectron Syndicate, Ltd.
Electrical and Mechanical Exhibition, Ltd.
Electric Coin-Freed Meter Dimming Syndicate, Ltd.
Electric Tramways Trust, Ltd.
"Guaranteed" Oil Filters, Ltd.
Hirst Magneto Co., Ltd.
Illuminating Engineering Co., Ltd.
Laboratories, Ltd.
"Le Radiant," Ltd.
Morris-Hawkins, Ltd.
Motor-Hiring Syndicate, Ltd.
S. P. (Suchostawer Patents) Syndicate, Ltd.
Schreiber Electric Battery Co., Ltd.
Scientific and Technical Publications, Ltd.
Scotch Water-Power Syndicate, Ltd.
Simplex Industrial Producer Gas Plants, Ltd.
Smoke Destroyer Co., Ltd.
Technical Inventions, Ltd.
Vulcan Dynamo and Motor Co., Ltd.

City Electric Light Co., Ltd. (Brisbane). — The directors' report for the half-year ended January 31st, 1913, states that after making additions to the reserve fund, dividend equalisation fund, franchise and purchase sinking fund, accident insurance fund and renewal replacement and contingencies account, there remains a credit balance of £7,148, which, with the balance brought forward, makes £9,092 to be disposed of. The directors recommend that a dividend be paid of 3 per cent. on the preference shares and of 6¼ per cent. on the fully-paid ordinary shares, and of 6¼ per cent. on the contributing shares. These dividends, together with the dividend duty, will absorb £7,639, leaving £1,453 to be carried forward. The directors have decided to issue on or before April 30th next 40,000 contributing shares paid up to 10s. per share. These will be issued to the shareholders in proportion to their present holding, and will represent about 28 shares to each 100 shares now held.

Indo-European Telegraph Co., Ltd.

The directors in their report for 1912 state that the company's negotiations with the Postmaster-General, and with the Imperial German Telegraph Administration previously referred to, are now far advanced. The agreements with those administrations, when concluded, will place at the disposal of the company the much-desired additional cross-Channel cable wire, and will, at the same time, embody an extension of the company's working agreement with the Postmaster-General. The company's new cable wire will be connected with a new land wire throughout the whole length of the company's system, which will shortly be completed. The Imperial Russian Government have informed the company that, in view of the fact that the company's present concession from that Government does not expire until 1925, negotiations for an extension of the same should be deferred for the present. Having regard to the ever-increasing importance of radio-telegraphy, the directors have acquired a controlling interest in the Galletti wireless system, a new and independent system of much promise. Important experiments to establish its value are now in progress, and the necessary funds for this, and for the acquisition of the controlling interest above referred to, have been provided by the company. The sum thus provided is represented by the holding of £32,200 of the capital of Galletti's Wireless Telegraph and Telephone Co., Ltd. (a company formed and controlled by this company), which stands in the balance-sheet at its par value of £32,200. In view, however, of the risks which must attend the development of an entirely new system, the directors propose to make provision out of the year's profits for the whole sum of £32,200 represented by this investment. As a result of the recent extension of the concessions from the Russian and Turkish Governments for the working of the Black Sea Cable (Odessa-Constantinople) the half interest held in that cable by this company (which stood in the balance-sheet at the value of £25,000 under the heading "investments in other telegraph companies") is now directly vested in this company, which assumes responsibility for half the working and maintenance expenses. The designation of the investment has accordingly been altered to "half interest in the Black Sea (Odessa-Constantinople) Cable." The company having taking over in respect of its half ownership of the cable its share of the already existing reserve fund for maintenance, the directors are enabled to constitute in the balance-sheet a "Black Sea Cable maintenance fund" to the amount of £15,000, which is represented by investments on the other side detailed under Schedule D. The company's revenue from message account and other sources, as shown in the revenue account, amounts to £183,411, as compared with £172,427 for 1911, showing an increase of £10,984. The expenses are, on commercial and general account, £58,820, and on maintenance account £32,155, making a total of £90,974, as against £86,087 for 1911, showing an increase of £4,887. The revenue account, therefore, shows a balance of £92,437, which sum is carried to profit and loss account, 1912, and after deduction of income-tax paid is reduced to £87,024. To this is added the balance brought forward of £12,144, making a total of £99,168. Deducting £10,813 provided for depreciation of the company's securities to date and the interim dividend of £10,625 already paid, there remains a balance available for distribution of £77,730. The directors now propose to declare a dividend for the six months ending December 31st, 1912, of 17s. 6d. per share (making with the interim dividend already paid 6 per cent. for the year) and a bonus of 20s. per share, both free of income-tax. They propose further to make the provision of £32,200 in connection with the Galletti purchase and experiments above referred to, carrying forward £13,655. They also propose to make a special distribution to the shareholders of £12,750, equivalent to 15s. per share, out of interest upon certain investments and advance accounts. This distribution also will be free of income-tax. The directors have sustained a severe loss in the death of their esteemed friend and colleague, Mr. Ludwig Delbrück, so long associated with them as a director. The position will shortly be filled by another gentleman, preferably representing Berlin interests. To their great regret also they have lost the services, through retirement for reasons of health, of Mr. Geo. Plate, who represented Bremen interests on the board.

Calcutta Tramways Co., Ltd.

The directors' report, as given in the *Financier*, states that the gross receipts and the working expenses for 1912 were as follows:—Receipts.—Calcutta, £208,427; Howrah, £8,606; total, £217,033. Working expenses.—Calcutta, £115,380; Howrah, £6,786; total, £122,166. Revenue balance.—Calcutta, £93,046; Howrah, £1,819; total, £94,866. The balance forward from 1911 accounts £3,918, and bank interest £18, bring the total to £98,903. Deduct interest on debenture stock and dividend on preference and ordinary shares paid, £44,775, leaving an available balance of £54,028, which the directors propose to deal with by the payment of a final dividend of 5s. per share, making 7½ per cent. for the year, £34,402, adding to the depreciation fund £15,000, and carrying forward £4,626. The depreciation fund at the commencement of the year stood at £64,136. After adding thereto £1,704, interest on investments, and £15,000 proposed to be allocated, as above, and deducting £9,158 written off for renewals and additional expenditure on power house plant during the year, the fund will stand at £71,682. The steady and continued growth of the business, aided to some extent by the abnormal traffic during the period of the Royal visit at the beginning of the year, has produced a further record in traffic receipts, which amount to £215,271, against £200,384 for 1911, or an increase of £14,887. The expenditure shows an increase of £7,780, principally due to increased mileage run, and to the complete overhaul of the power station. Part of the cost of the latter, represented by certain additions to the plant to increase the efficiency of the station, rendered necessary by the growth of the traffic, has been charged to the depreciation reserve fund. The Howrah lines have also shown considerable improvement, as, with practically the same mileage, they show an increase in traffic receipts of £1,205, the increase in expenditure being £385, principally due to permanent way repairs.

Oriental Telephone and Electric Co., Ltd.

The directors' report for the year ended December 31st last states that, including £23,715 brought forward from December 31st, 1911, and after deducting the interim dividends of 3 per cent., paid November 1st last, on both the preference and ordinary shares, and making the necessary provision for redemption of the debenture stock and other charges, as shown in the net revenue account, the amount to be dealt with is £57,054. The directors recommend that this sum be appropriated as follows, viz.:—A final dividend of 3 per cent. (less income-tax) for the year on the preference shares, £1,500; a final dividend of 7 per cent. (free of income-tax) on the ordinary shares, making 10 per cent. for the year, £12,552; transfer to reserve account, £5,000; staff pension fund, £2,000; carrying forward £36,002. All the company's exchanges, together with those of the affiliated companies, continue to show improved revenues. The Bombay Telephone Co., Ltd., has further increased its dividend from 9 to 10 per cent., whilst the Telephone Co. of Egypt, Ltd., the Bengal Telephone Co., Ltd., and the China and Japan Telephone and Electric Co., Ltd., have paid their previous rates of 10, 6 and 5 per cent. respectively. In addition to the extensions at Madras, referred to in the last report, considerable extensions and improvements have been made during the past year at Rangoon and in Mauritius, and are now in full working, promising good results. In order to provide better and permanent quarters for the increasing business in the island of Mauritius, the company recently purchased a freehold plot of land in the town of Port Louis, upon which a substantial building is in course of erection, which is expected to be completed by the end of the current year.

The annual meeting is called for April 30th.

Anglo-American Telegraph Co., Ltd.

The directors' report for the year ended March 31st, 1913, states that three quarterly interim dividends of 15s. per cent. on the ordinary stock, and £1 10s. per cent. on the preferred stock, were paid on May 1st, August 1st and November 1st, 1912, absorbing £157,500, and the directors on February 1st last paid the final dividend for the year ending December 31st, 1912, amounting to £1 10s. per cent. on the ordinary stock, £1 10s. per cent. on the preferred stock, and £1 10s. per cent. on the deferred stock. These payments absorbed altogether £262,500, being the rent paid by the Western Union Telegraph Co. for the year, equal to 3¾ per cent. on the ordinary stock, 6 per cent. on the preferred stock, and 1½ per cent. on the deferred stock. The balance at credit of revenue account includes £1,621 bank interest, &c., received during the year, and now amounts to £67,246. The present articles of association are quite obsolete and new ones have been prepared. These accord with present-day law and requirements, and contain provisions which are desirable now that the company has leased its cables to the Western Union Telegraph Co. The rights of the stockholders with regard to dividends and voting and in a winding-up have not been interfered with. The new articles will be submitted at the extraordinary general meeting immediately at the close of the annual meeting on April 29th.

STOCKS AND SHARES.

Tuesday Evening.

Stock Exchange markets for the time being seem to have got into smoother waters. The long-deferred fall in the Bank Rate took place last Thursday, and it is expected to be followed by a further reduction this week, provided, that is, that the political outlook abroad does not cloud over again. It is recognised, however, that the Bank of England directors, in not putting down the rate a full point, intended to give the financial world a hint that they did not regard the prospect as entirely pacific; but if the step is taken this Thursday, most people will regard it as a weighty opinion that the war in the Near East is over for all practical purposes.

The latest untoward development abroad is the straining of relations between Japan and the United States. Trouble has been brewing for some time between the two peoples, according to private information, and for the moment it looks as though there might be a rupture of peaceful feeling, unless the Americans care to placate their Western neighbours.

Home Railway Stocks failed to derive immediate benefit from cheaper money, but the market looks stronger now. The Under-

ground list is quiet. Districts dipped to 39½, but recovered to 40. Metropolitans are ½ down. Central London Ordinary and Preferred each put on a point, and the Deferred stock maintained its improvement of last week. Underground Electric shares are ¼ easier, though the "A" remain at 11s. 6d. The immediate result of the reduction of the Bank Rate was an upward march in some score or so of Home Railway prior charge stocks, in which movement there participated, to the extent of a point or so, Metropolitan 3½ per cent. Preference, both the District Debenture stocks, and the four City and South London Preference issues. There is a general impression that this improvement will go still further. Underground Electric 6 per cent. Income bonds eased off to 93, and London Electric 4 per cent. Preference stock at 76 is a point down.

It is worth noticing, as having a possible bearing upon railway stocks as a whole, that the Scottish railway issues have shown extreme strength this week, upon the assumption that the companies in the North will be shortly revising their fares in the upward direction. It is understood that the English companies will follow their example before long; indeed, they may be said to have started this already in a mild way, but if there should be a concerted movement, as authorised by the recently-passed Railways Act, there may be better days in store for the Home Railway market, until labour stirs up fresh strife. The British Electric Traction issues continue to fall. Yorkshire 4½ per cent. Debenture stock at 83½ is a point higher.

The Electricity Supply market has little change to disturb its customary placidity. Metropolitans were back to 3½, but this fall of ⅛ is more than counterbalanced by a rise of 5s. in Smithfields, which carried up the price to 1⅛. County First Debenture stock lost a point upon the offering of a small parcel in the market the other day.

The Manufacturing group is quiet, a rise of 30s. in Telegraph Constructions being the principal feature. Since the recent increase in the dividend to 20 per cent., there has been a persistent demand for the shares, while the Debenture stock at 97½ is also slightly higher. Babcock & Wilcox eased off to 3 3/16 upon the appearance of the report, which, however, should have had an opposite effect upon the price of the shares, for it makes excellent reading, and the dividend is increased to 16 per cent.—equivalent to 32 per cent. upon the capital before this was doubled by the distribution of bonus shares last year. Some people appear to dislike the creation of the proposed Second Preference shares, but as the Company will have no difficulty in placing these, it will be getting the money at 5 per cent., and should be able to earn a great deal more than this upon the new capital. These new Preference shares, by the way, constitute an excellent investment, the security for them being admirable.

In the Telegraph department, Indo-Europeans, after their substantial advance, reacted 10s., but remain a good market. Investors are on the look-out for Telegraph descriptions which pay well, and offer a reasonable chance of enhanced value. Commercial Cable Debenture stock again rose 1½. Anglo-American Telegraph Preferred continues to harden. Eastern Extension shares put on ⅛, and Globe Preference are a similar fraction to the good. The Telephone list is also firm. Monte Videos are 1/16 higher, Oriental Preference rose 3/32, and Telephone of Egypt Debenture stock is ½ up. Reuter's eased off to the extent of ⅛, and American Telephone stock went back a point, which was picked up by the Company's Collateral Trust bonds.

The Canadian-Latin group is remarkable chiefly for a recovery of 8 points in Montreal Light, Heat and Power shares, which restored the quotation to 233½. The price is run up and down by comparatively small demand and supply; sometimes it moves without any stock changing hands at all. Another quarterly dividend of 2½ per cent. is just announced. Kaministiquia shares went back to 132½ on the declaration of the quarterly dividend of 1½ per cent.—certain holders had been expecting the distribution to be raised to the rate of 6 per cent. per annum this time.

The Mexican division is what the newspapers call "marking time." Mexico Trams at 110 are the turn higher, but the 5 per cent. bonds are ½ down, while in the Light and Power issues there have occurred no changes worth mentioning. Electrical Development of Ontario bonds at 95 show a rise of 1½, and there is a better tone in the market for Rio bonds of both classes. British Columbia stocks are harder, as it was expected would be the case so soon as the time expired for selling the rights to the new issues. Brazil Tractions drooped to 101 in consequence of a severe fall in Brazil Railways shares.

Part of the improvement in the Anglo-Argentine Tramways group has oozed out of the Debentures. The new scrip, by the way, is now quoted as fully-paid, and can be bought at 99, at which the yield is £5 1s. on the money. According to the accounts published last week, there is a surplus, after meeting all the Debenture interest, of about £350,000, so it is somewhat surprising that the Debenture stocks should be dull. Calcutta Preference regained their small fall of last week, and Lisbons hardened upon the declaration of the dividend, to which reference was made here in our previous notes.

The Rubber market has fallen into stagnation again, and prices are, on the whole, dullish, though the commodity is somewhat firmer. Armament shares are disposed to droop, in consequence of the new issues which are being made by Armstrongs and Vickers. Lively dealings are taking place in the latter on the basis of 5s. to 5s. 6d. premium for the renunciation letters. Amongst the few Stock Exchange markets to show pronounced animation, that for Copper shares stands out prominently. Copper, the metal, is expected to go much higher; but, inasmuch as the statistics are of so variable a quality, it is difficult for outsiders to gauge a position which is so largely capable of manipulation by speculators in some of the American centres.

MARKET QUOTATIONS.

It should be remembered, in making use of the figures appearing in the following list, that in some cases the prices are only general, and may vary according to quantities and other circumstances.

Wednesday, April 23rd.

CHEMICALS, &c.		Latest Price.	Fortnight's Inc. or Dec.
a Acid, Hydrochloric	per cwt.	5/-	..
a ,, Nitric	,,	22/-	..
a ,, Oxalic	per lb.	2¾d.	..
a ,, Sulphuric	per cwt.	5/6	..
a Ammoniac Sal	,,	42/-	..
a Ammonia, Muriate (large crystal)	per ton	£29 10	..
a Bleaching powder	,,	£6 5	..
a Bisulphide of Carbon	,,	£18	..
a Borax	,,	£17 10	..
a Copper Sulphate	,,	£23 5	10/- dec.
a Lead, Nitrate	,,	£27	£2 10s. dec.
a ,, White Sugar	,,	£25 5	£2 5s. dec.
a ,, Peroxide	,,	£32	..
c Methylated Spirit	per gal.	2/6	..
a Potassium, Bichromate, in casks	per lb.	5½d.	..
a Potash, Caustic (88/90 %)	per ton	£22 10	..
a ,, Chlorate	per lb.	8½d.	..
a ,, Perchlorate	,,	4½d.	..
a Potassium, Cyanide (98/100 %) (for mining purposes only)	,,	7½d.	..
a Shellac	per cwt.	80/-	..
a Sulphate of Magnesia	per ton	£4 10	..
a Sulphur, Sublimed Flowers	,,	£6 10	..
a ,, Recovered	,,	£5 10	..
a ,, Lump	,,	£5	..
a Soda, Caustic (white 70/72 %)	,,	£10 5	..
a ,, Chlorate	per lb.	3½d.	..
a ,, Crystals	per ton	£3 5	..
a Sodium Bichromate, casks	per lb.	3d.	..
METALS, &c.			
b Aluminium Ingots, in ton lots	per ton	£95	..
b ,, Wire, in ton lots (1 to 14 S.W.G.)	,,	£112	..
b ,, Sheet, in ton lots	,,	£120	..
p Babbitt's metal ingots	,,	£50 to £221	..
c Brass (rolled metal 2" to 12" basis)	per lb.	8⅝d.	⅛d. inc.
c ,, Tube (brazed)	,,	10⅛d.	..
c ,, (solid drawn)	,,	9d.	..
c ,, Wire, basis	,,	8⅞d.	⅛d. inc.
c Copper Tubes (brazed)	,,	10¼d.	1⅛d. dec.
c ,, (solid drawn)	,,	9⅝d.	1⅛d. dec.
g ,, Bars (best selected)	per ton	£85	£1 inc.
g ,, Sheet	,,	£85	£1 inc.
g ,, Rod	,,	£85	£1 inc.
d ,, (Electrolytic) Bars	,,	£72 10	£2 15s. inc.
d ,, Sheets	,,	£89 10	£3 inc.
d ,, ,, Rods	,,	£77 10	£2 10s. inc.
d ,, ,, H.C. Wire	per lb.	9¼d.	⅛d. inc.
f Ebonite Rod	,,	4/6	..
f ,, Sheet	,,	4/-	..
n German Silver Wire	,,	1/10	..
h Gutta-percha, fine	,,	7/- to 8/-	..
h India-rubber, Para fine	,,	8/5½	½d. inc.
l Iron Pig (Cleveland warrants)	per ton	68/4½	1/10½ inc.
l ,, Wire, galv. No. 8, P.O. qual.	,,	£14	..
g Lead, English Pig	,,	£18 12 6 to £18 17 6	£1. inc.
m Manganin Wire No. 28	per lb.	6/6	..
g Mercury	per bot.	£7 10	..
e Mica (in original cases) small	per lb.	6d. to 2s.	..
e ,, ,, ,, medium	,,	3/6 to 6/-	..
e ,, ,, ,, large	,,	7/6 to 11/-	..
o Nickel, sheet, wire, &c.	,,	3/6 to 4/6 nom.	..
p Phosphor Bronze, plain castings	,,	1/1 to 1/3½	..
p ,, ,, rolled bars & rods	,,	1/0½ to 1/2	..
p ,, ,, rolled strip & sheet	,,	1/2½ to 1/5½	..
o Platinum	per oz.	185/-	..
d Silicium Bronze Wire	per lb.	11d.	..
r Steel, Magnet, in bars	per ton	£55	..
g Tin, Block (English)	,,	£231 to £233	£1 dec.
n ,, Wire, Nos. 1 to 16	per lb.	2/7	..
p White Anti-friction Metals	per ton	£45 to £228	..
k Zinc, Sh't (Vieille Montagne bnd.)	,,	£29	10/- inc.

Quotations supplied by—

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
f India-Rubber, Gutta-Percha and Telegraph Works Co., Ltd.
g James & Shakspeare.
h Edward Till & Co.
l Bolling & Lowe.
k Morris Ashby, Ltd.
l Richard Johnson & Nephew, Ltd.
m W. T. Glover & Co., Ltd.
n P. Ormiston & Sons
o Johnson, Matthey & Co., Ltd.
p
r W. F. Dennis & Co.

Oldham, Ashton and Hyde Electric Tramway, Ltd.

—The directors' report for 1912 states that the total revenue was £34,579, and the expenditure (including £1,600 for debenture interest and £4,000 placed to provision for renewals account) was £27,791, leaving a net profit of £6,788, plus £180 brought forward. There is to be placed to reserve fund £1,250; dividend, 5 per cent. per annum on the cumulative preference shares, absorbs £2,500; dividend on the ordinary shares at the rate of 7 per cent. per annum for the six months ended December 31st, 1912, making, with the interim dividend 6 per cent. for the year, £3,000; leaving to carry forward £218. During the past year £975 has been expended on capital account. The increase in the traffic receipts of £1,905, following on an increase of £1,202 for 1911, is principally due to better trade. £4,000 has been charged through the revenue account to renewals account, as compared with £2,000 for 1911.

SHARE LIST OF ELECTRICAL COMPANIES.

ENGLISH ELECTRICITY SUPPLY AND POWER COMPANIES.

NAME.	Stock or Share.	Dividends for 1911.	Dividends for 1912.	Closing Quotations April 22nd.	Rise + or Fall —	Present Yield p.c. £ s. d.
Bournemouth & Poole, Ord.	10	5½	6	9⅛ – 10⅛	..	5 18 5
Do. 4½ % Pref.	10	4½	4½	8⅝ – 9⅜	..	4 14 9
Do. Second 6 % Pref.	10	6	6	10 – 10⅜	..	5 14 3
Do. 4½ % Deb. Stock	Stock	4½	4½	96 – 98	..	4 11 10
Brompton & Kensington, Ord.	5	10	10	8⅞ – 9⅛	..	5 6 8
Do. 7 % Cum. Pref.	5	7	7	8⅞ – 8⅞	..	3 18 10
Central Electric Supply, 4 % Guar. Deb.	100	4	4	95 – 98	..	4 1 8
Charing Cross, West End & City	5	5	5†	4⅛ – 5	..	5 0 0
Do. 4½ % Cum. Pref.	5	4½	4½	4⅜ – 4⅝	..	4 14 9
Do. "City Undertaking" 4½ % Cum. Pref.	5	4½	4½	3⅞ – 4⅛	..	5 2 10
Do. Do. 4 % Deb.	100	4	4	91½ – 93½	..	4 5 7
Chelsea, Ord.	5	5	4†	4⅜ – 5	..	5 0 0
Do. 4½ % Deb.	Stock	4½	4½	96 – 99	..	4 10 11
City of London, Ord.	10	8	9	16 – 17½	..	5 6 8
Do. 6 % Cum. Pref.	10	6	6	12 – 13	..	4 10 7
Do. 5 % Deb.	Stock	5	5	116 –120	..	4 3 4
Do. 4½ % Second Deb.	100	4½	4½	100 –102	..	4 8 3
County of London, Ord.	10	6	6	10½ – 11	..	5 9 1
Do. 6 % Pref.	10	6	6	11½ – 12	..	5 0 0
Do. 4½ % Deb.	Stock	4½	4½	103 –105	–1	4 5 9
Do. 4½ % Second Deb.	Stock	4½	4½	99 –102	..	4 8 8
Edmundson's, Ord.	£3	Nil	..	1/16 – 1/16	..	Nil
Do. 6 % Cum. Pref.	5	Nil	3	4⅛ – 4⅜	..	..
Do. 6% Non-Cum. Pref.	5	..	..	1⅛ – 2	..	..
Do. 4½ % First Mort. Deb.	100	4½	4½	81 – 84	..	5 7 2
Folkestone	5	6	6	4½ – 5	..	6 0 0
Do. 5 % Cum. Pref.	5	5	5	4½ – 5	..	5 0 0
Do. 4½ % First Deb.	100	4½	4½	90 – 92	..	4 17 10
Hove	5	9	9†	7½ – 7¾	..	5 16 2
Kensington & Knightsbridge, Ord	5	9	8†	7½ – 8	..	5 12 6
Do. 4 % Deb.	Stock	4	4	90 – 93	..	4 6 0
Kent Elec. Power, 4½ % Deb.	Stock	4½	4½	76 – 80	..	5 12 6
London Electric, Ord.	8	2½	..	1⅜ – 1⅝	..	4 0 0
Do. 6 % Pref.	5	6	6	4⅜ – 5⅛	..	5 17 1
Do. 4 % First Mort. Deb.	Stock	4	4	91 – 94	..	4 5 1
Metropolitan	5	4	4†	3½ – 3⅝	– ⅛	5 6 8
Do. 4½ % Cum. Pref.	5	4½	4½	4⅛ – 4⅜	..	4 17 4
Do. 4½ % First Mort. Deb.	Stock	4½	4½	97 –100	..	4 10 0
Do. 3½ % Mort. Deb.	Stock	3½	3½	84 – 86	..	4 1 5
Midland Electric Corporation 4½ % First Mort. Deb.	100	4½	4½	99 –102	..	4 8 3
Newcastle-on-Tyne 5 % Pref., Non-Cum.	5	5	5	4⅛ – 4⅜	..	5 5 3
North Metropolitan Power Supply, 5 % Mortgages (Red.)	100	5	5	97½–100½	..	4 19 6
Notting Hill, 6 % Non-Cum. Pref.	10	6	6	9⅜ – 10⅜	..	5 11 7
Oxford	5	7½	6†	5⅞ – 6⅜	..	5 13 9
St. James' and Pall Mall, Ord.	5	10	10†	8⅜ – 9	..	5 11 1
Do. 7 % Pref.	5	7	7	6⅜ – 7⅛	..	4 16 7
Do. 3½ % Deb.	100	3½	3½	84 – 87	..	4 0 6
Smithfield Markets, Ord.	5	2	2	⅞ – 1⅛	+ ⅛	7 5 6
South London, Ord.	4	5	6	2⅛ – 2⅜	..	7 7 8
Do. 5 % First Mort. Deb.	100	5	5	97 –100	..	5 0 0
South Metropolitan, 7 % Pref.	1	7	7	1 1/16 – 1 1/16	..	5 17 11
Do. 4½ % First Deb. Stock	100	4½	4½	94 – 97	..	4 11 3
Urban, Ord.	£3	Nil	..	¼ – ⅜	..	..
Do. 5 % Cum. Pref.	5	2	‡	2⅛ – 2⅜	..	..
Do. 4½ % First Mort. Deb.	100	4½	4½	83 – 86	..	5 2 3
Westminster, Ord.	5	10	10	8½ – 9	..	5 11 1
Do. 4½ % Cum. Pref.	5	4½	4½	5 – 5⅛	..	4 3 9

COLONIAL AND FOREIGN ELECTRICITY SUPPLY AND POWER.

Adelaide, 6 % Pref.	5	6	6	5 – 5⅛	..	5 14 3
Calcutta, Ord.	5	8½	7†	6⅝ – 7⅛	..	5 19 4
Do. 5 % Pref.	5	5	5	4⅞ – 5⅛	..	4 17 7
Calgary Power, 1st Mort. Bds.	100	5	5	93 – 95	..	5 5 8
Canadian Gen. El. Com.	$100	7	7	115 –119	..	5 17 8
Do. 7 % Pref.	$100	7	7	120 –125	..	5 12 0
Cordoba Lt., Power and T., Ord.	1	3		1/16 – 3/16	..	5 14 3
Do. 5 % Deb.	100	5	5	94 – 96	..	5 4 2
Elec. Lt. and P. of Cochabamba, 7 % Bonds	100	6	6	93 – 95	..	6 6 4
Elec. Supply Victoria, 6 % 1st Mort. Deb.	100	5	5	90 – 93	..	5 7 6
Elec. Dev. Ontario, 5 % 1st Mort. Bonds	$500	5	5	94 – 96	+1½	5 4 2
Kalgoorlie Elec. P. and L., Ord.	10/-	Nil	..	1/16 – 3/16	..	Nil
Do. 6 % Pref.	1	6	6	⅛ – ⅜	..	9 15 2
Kaministiquia Power, 5% G. Bs.	$500	5	5	100 –102	–1	4 18 0
Madras, Ord.	5	Nil	..	1⅜ – 1⅝	..	..
Melbourne, 6 % 1st Mort. Deb.	100	5	5	101 –104	..	4 16 2
Mexican El. Lt., 5 % 1st M. Bds.	..	5	5	82 – 85	..	5 17 8
Mexican Lt. & Power, Common	$100	4	4†	77 – 80	..	5 0 0
Do. 7 % Cum. Pref.	$100	7	7	105 –108	..	6 9 8
Do. 5 % 1st Mort. Gold Bds.	..	5	5	92½ – 94½	..	5 5 10
Monterey Rly. Light & Power, 5 % 1st Mort. Deb.	100	5	5	83 – 86	..	5 16 3
Montreal, Lt., H. and Power	$100	8	9†	231 –226	–8	3 16 3
Northern, Lt., Power and Coal, 5 % 1st Mort. Bonds	$500	5	5a	10 – 20	..	..
River Plate, Ord.	Stock	10	..	217 –227	..	4 8 0
Do. 6 % Non-Cum. Pref.	Do.	6	6	105 –110	..	5 9 1
Do. 5 % Deb. Stock	Do.	5	5	100 –102	..	4 18 0
Roy. Elec. Co., Montreal, 4½ % 1st Mort. Deb.	100	4½	4½	100 –102	..	4 8 3
Shawinigan Water, Capital	$100	5	5	157½ –142½	..	3 10 2
Do. 5 % Con. 1st Mort. Bonds	$500	5	5	107 –109	..	4 11 9
Do. 4½ % Per. Deb.	Stock	4½	4½	101½–103½	..	4 7 0
Toronto Power, 4½ % Deb.	Do.	4½	4½	97½– 99½	..	4 10 6
Vera Cruz Lt., P. and T., 5 % 1st Mort. Deb.	100	5	5	91 – 94	..	5 6 5
Victoria Falls Power, Pref.	1	11¾d.	17⅝d.	⅛ – ⅛	..	..
West Kootenay Power and Lt., 1st Mort. 6 % Gold	100	6	6	106 –108	..	5 11 1

TELEGRAPH AND TELEPHONE COMPANIES.

Amazon Telegraph	10	4	4½†	7 – 7⅛	..	6 0 0
Do. 5 % Deb. Red.	Stock	5	5	97 – 99	..	5 1 0
American Telep. & Teleg., Cap.	$100	8	8†	133 –135	–1	5 18 6
Do. Collat. Trust	$1000	4	4	93 – 94	+1	4 5 1
Anglo-American Telegraph	Stock	3	3	6⅛ – 6⅝	..	4 8 3
Do. 6 % Pref.	Do.	6	6	112 –113	+ ½	5 6 2
Do. Def.	Do.	30/-	..	24⅜ – 24⅝	..	6 1 10
Anglo-Portuguese Tel., 5 % Mort. Deb.	100	5	5	99½–101½	..	4 18 6
Chili Telephone	5	7	8	7¼ – 7⅜	..	5 1 1
Commercial Cable, Stlg. 4% Deb.	Stock	4	4	83 – 85	+½	4 14 2
Cuba Telegraph	10	6	6†	8 – 9	..	6 9 9
Do. 10 % Pref.	10	10	10	16 – 17	..	5 17 8
Direct Spanish Telegraph, Ord.	5	4	4†	3½ – 3⅝	..	5 6 8
Do. 10 % Cum. Pref.	5	10	10	6½ – 7	..	7 2 10
Direct United States Cable	10	5	4	6⅜ – 7⅛	..	5 10 4
Direct W. India Cable, 4½ % Reg. Deb.	100	4½	4½	99 –101	..	4 9 0
Eastern Telegraph, Ord. Stock	Stock	7	7†	185 –188	..	5 1 5
Do. 8½ % Pref. Stock	Do.	8½	8½	77⅛ – 79½	– ⅛	4 8 1
Do. 4 % Mort. Deb.	Dc.	4	4	94 – 96	– 1	4 8 4
Eastern Extension	10	7	7†	13 – 13⅛	+ ⅛	5 3 8
Do. 4 % Deb.	Stock	4	4	95 – 97	..	4 2 6
East and S. Africa Tel. 4 % Mt. Db. Mauritius Sub.	25	4	4	93½–101½	..	3 18 10
Globe Telegraph and Trust	10	6	6†	10⅞ – 11½	..	5 6 8
Do. 6 % Pref.	10	6	6	12⅝ – 13⅜	+ ⅛	4 11 4
Great Northern Telegraph	10	18	20	32 – 34	..	5 17 8
Indo-European Telegraph	25	13	5†	59½ – 61½	– ½	5 5 8
Mackay Companies Common	100	5	5	83 – 86	..	5 16 3
Do. 4 % Cum. Pref.	$100	4	4	69 – 72	..	5 11 1
Marconi's Wireless Telegraph	1	20	..	4⅛ – 4½	– ⅛	4 14 1
Do. 7½ % Cum. Partic. Pref.	1	17	..	8⅜ – 8½	..	4 10 8
Monte Video Telephone, Ord.	1	6	6†	1 1/16 – 1 3/16	+ 1/16	5 1 1
Do. 5 % Pref.	1	5	5	⅞ – 1	..	5 14 3
New York Telep., 4½% Gen. Bnds.	100	4½	4½	99⅜–100⅜	– ⅛	4 9 9
Oriental Telep. and Elec.	1	8	6†	1 3/16 – 1 5/16	..	4 2 6
Do. 6 % Cum. Pref.	1	6	6	1 3/16 – 1 5/16	+ 1/32	4 16 0
Do. 4 % Red. Deb.	Stock	4	4	88 – 90	..	4 8 11
Pacific and European Tel., 4 % Guar. Debs.	Do.	4	4	97½ – 99½	..	4 0 5
Reuter's	10	10	10†	11⅛ – 11⅝	– ⅛	8 12 0
Do. New Shares	10	..	..	10⅞ –11	..	..
Submarine Cables Trust	Cert.	6	6	124 –127	..	4 14 6
Telephone Co. of Egypt, 4½ % Deb. Red.	Stock	4½	4½	96½ – 98½	+ ½	4 11 5
United River Plate Telephone	5	3	..	7 1/16 – 7 1/16	..	5 4 0
Do. 5 % Cum. Pref.	5	5	5	5⅛ – 5⅜	..	4 9 0
West Coast of America	2½	2½	..	1⅛ – 1⅜	..	4 8 4
Do. 4 % Debs., 1 to 500 guar. by Bras. Sub. Tel.	100	4	4	95 – 98	..	4 1 8
West India and Panama Teleg.	10	2½	1½†	2⅛ – 3⅛	– ⅛	..
Do. 6 % Cum. 1st Pref.	10	6	6	10 – 10½	..	5 14 3
Do. 6 % Cum. 2nd Pref.	10	6	6	9⅝ – 10	..	6 0 0
Do. 5 % Debs.	100	5	5	101 –103	..	4 17 1
Western Telegraph, Ltd.	10	7	7†	13 – 13½	..	5 3 8
Do. 4 % Deb.	Stock	4	4	95 – 97	..	4 2 6
Western Union 4½ % Fdg. Bonds	$1000	4½	4½	96 – 99	..	4 11 0

*Unless otherwise stated, all shares are fully paid. a Paid in deferred interest warrants. † Interim Dividend. ‡ 8s. in Funded Dividend Certs.

CONTINUED ON NEXT PAGE.

SHARE LIST OF ELECTRICAL COMPANIES.—(*Continued.*)

ELECTRIC RAILWAYS AND TRAMWAYS.—HOME.

NAME.	Stock or Share.	Dividends for 1911.	Dividends for 1912.	Closing Quotations April 22nd.	Rise + or Fall —	Present Yield p.c.
	*					£ s. d.
Bath Trams, Pref. Ord.	1	Nil	Nil	⅛ — ¼	..	Nil
Do. 5 % Pref.	1	5	5	11/16 — 13/16	..	6 8 1
Do. 4½ % Deb.	100	4½	4½	74 — 79	..	5 14 0
Brit. Elec. Trac., 6 % Pref. ..	100	..	..	8½ — 10½	..	..
Do. Do. Deferred ..	100	..	..	3½ — 5½	..	..
Do. Do. 6 % Cum. Pr'f.	100	6	6	84 — 87	−1	6 18 0
Do. 7 % Non-Cum. Pr'f.	100	..	..	82 — 85	−1	..
Do. 5 % Perp. Deb. ..	100	5	5	88½ — 92½	..	5 8 1
Do. 4½ % 2nd Deb. ..	100	4½	4½	75 — 79	..	5 13 11
Central London Railway, Ord.	100	3	3	81 — 83	+1	‡4 16 5
Do. Pref.	100	4	4	84 — 86	+1	‡4 13 0
Do. Def.	100	2	2	79 — 81	..	‡4 18 9
Do. 4 % Deb.	100	4	4	98 —100	..	4 0 0
City & S. London, 5 % Pref., 1891	100	5	5	100 —102	+1½	4 18 0
Do. Do. 1896	100	5	5	100 —102	+ ⅜	4 18 0
Do. Do. 1901	100	5	5	98 —101	+1	4 19 0
Do. Do. 1908	100	5	5	96 — 99	+1	5 1 0
Do. 4 % Deb.	100	4	4	94 — 96	..	4 3 4
Dublin United Trams, 6 % Pref.	10	6	6	11⅜ — 12⅜	..	4 18 0
Great Northern & City, Pr'f. Ord	10	Nil	Nil	2⅜ — 2⅝	..	Nil
Hastings Trams, 6 % Pref. ..	1	6	6†	⅝ — ¾	..	7 7 8
Do. 4½ % Deb.	100	4½	4½	66⅜ — 71⅜	..	6 5 5
sle of Thanet Trams, 5 % Pref.	5	2½	2½	2⅜ — 2⅝	..	4 15 8
Do. 4 % Deb.	100	4	4	75 — 80	..	5 0 0
Lancashire United, 5 % Deb. ..	100	5	5	79 — 80	..	6 5 0
London Elec. Railw'ys, 4 % Deb.	100	4	4	94 — 96	..	4 3 4
London United Trams, 5 % Pref.	10	Nil	..	4⅛ — 5	..	..
Do. 4 % Deb.	100	4	4	63 — 67	..	5 19 5

NAME.	Stock or Share.	Dividends for 1911.	Dividends for 1912.	Closing Quotations April 22nd.	Rise + or Fall —	Present Yield p.c.
	*					£ s. d.
Metropolitan Railway Consol. ..	100	1⅞	1⅞	52½ — 52⅝	— ⅛	3 1 7
Do. Surplus Lands	100	2⅛	2⅛	61 — 63	..	4 7 4
Do. 3½ % Deb.	100	3½	3½	85 — 87	..	4 0 6
Do. 3½ % Pref.	100	3½	3½	82 — 84	+1	4 3 4
Do. 3½ % Con. Pref.	100	3½	3½	80 — 82	..	4 5 4
Metropolitan District Ord. ..	100	Nil	Nil	39⅜ — 40½	..	Nil
Do. 6 % Deb.	100	6	6	137 —139	+1	4 6 4
Do. 4 % Deb.	100	4	4	94 — 96	+1	4 3 4
Do. 4 % Prior Lien	100	4	4	98 —100	..	3 19 8
Do. 4½ % First Pref.	100	4½	4½	85 — 87	..	5 1 2
Do. 3½ % Gtd.	100	3½	3½	75 — 77	..	4 10 11
Metropolitan Elec. Trams, Ord.	1	6	5†	3⅜ — 1⅝	..	5 18 6
Do. 5 % Pref.	1	5	5	1¼ — 1⅜	..	6 3 1
Do. 4½ % Deb.	100	4½	4½	87 — 91	..	4 18 11
Do. 5 % Deb.	100	5	5	91½ — 94½	..	5 5 10
Potteries, Ord.	1	3½	..	⅝ — ¾	..	..
Do. 5 % Pref.	1	5	5	13/16 — 15/16	..	6 19 0
Do. 4½ % Deb.	100	4½	4½	84 — 87	..	5 3
South Metro. Trams, 6 % Pref.	1	6	..	1⅛ — 1⅜	..	7 7 8
Do. 4 % Deb.	100	4	4	65 — 70	..	5 14 4
Underground Elec. Railways	10	..	..	4⅛ — 4⅜	— ⅛	Nil
Do. "A"	1/-	..	..	⅛ — 1/16	..	Nil
Do. 6% First Cum. Inc. Deb.	100	..	6	110 —112	+1	5 7 2
Do. 4½ % Bonds	100	4½	4½	97 — 99	..	4 10 11
Do. 6 % Income	100	1½	6 †	92½ — 93½	— ½	6 8 4
Yorkshire (West Riding), Ord.	5	Nil	..	⅜ — ⅝	..	Nil
Do. 6 % Pref.	5	8	8†	8¼ — 8½	..	4 0 0
Do. 4½ % Deb.	100	4½	4½	81 — 85	+1	5 6 0

ELECTRICAL RAILWAYS AND TRAMWAYS.—COLONIAL AND FOREIGN.

Anglo-Arg. Trams, 1st Pref. ..	5	5½	5½	4½ — 5⅛	..	5 8 7
Do. 2nd Pref.	5	5½	5½	4⅜ — 4¾	..	5 12 10
Do. 4 % Deb.	100	4	4	90½ — 92½	..	4 6 6
Do. 4½ % Deb.	100	4½	4½	99 —101	+ ½	4 9 1
Do. 5 % Deb.	100	5	5	99 —101	— ½	4 19 0
Auckland Trams, 5 % Deb. ..	100	5	5	101 —103	..	4 17 1
Bombay Elec. S. & Trams, Pref.	10	6	6	10⅜ — 11⅛	..	5 4 4
Do. 4½ % Deb.	100	4½	4½	96 — 98	..	4 11 10
Do. 5 % 2nd Deb.	100	5	5	97 — 99	..	5 1 0
Brazilian Traction Light and Power	$100	..	6†	100 —102	— ½	5 17 8
Brisbane Trams Invt., Ord. ..	5	8	8†	7⅛ — 7⅝	..	5 5 0
Do. 5 % Pref.	5	5	5	4⅜ — 5⅛	..	4 15 8
Do. 4½ % Deb.	100	4½	4½	100 —103	..	4 7 5
B. Columbia Elec. Rly., Def. ..	100	8	8†	135½ —138½	..	5 15 7
Do. Pref. Ord.	100	6	6	113⅛ —116⅛	+1½	5 3 0
Do. 5 % Pref.	100	5	5	103 —106	..	4 14 4
Do. 4½ % 1st Mort. Deb. ..	40	4½	4½	100 —103	..	4 7 5
Do. 4½ % Vancouver Deb. ..	100	4½	4½	100 —102	..	4 8 3
Do. 4½ % Con. Deb.	100	4½	4½	95 — 97	..	4 7 8
Calcutta Trams, Ord.	5	7	5†	5⅜ — 6¼	..	5 12 0
Do. 5 % Pref.	5	5	5	4⅛ — 5⅛	+1/16	4 17 7
Do. 4½ % Deb.	100	4½	4½	97⅛ —100⅛	..	4 9 7
Cape Electric Trams	1	2½	..	1⅛ — 1⅜	..	..
City Buenos Aires Trams (1904)	5	6	6†	5⅛ — 5⅜	..	4 10 0
Do. 4 % Deb.	100	4	4	95 — 99	..	4 0 10
Colombo Elec. Tr. & Lt., 5 % Deb.	100	5	5	98 — 97	..	5 8 1
Havana Elec. Rly., 5 % Bonds	$1000	5	5	97 —101	..	4 19 0
Kalgoorlie Elec. Trams	1	Nil	..	⅞ — 15/16	..	Nil
Do. 5 % A Deb.	100	5	5	88 — 88	..	5 13 8
Do. 6 % B Deb.	100	6	8	25 — 35	..	..

La Plata Elec. Trms, Ord. ..	1	Nil	..	1/16 — 1/8	..	..
Do. Pref.	1	6	..	1/16 — 1/16	+ 1/16	5 13 0
Lisbon Elec. Trams, Ord. ..	1	6	6†	1⅛ — 1⅜	..	4 7 3
Do. 6 % Pref.	1	6	6	1 — 1¼	..	4 16 0
Do. 5 % Deb.	100	5	5	92 — 97	..	5 3 1
Madras Elec. Tr. (1904), Deb. ..	100	5	5	103 —105	..	4 15 3
Manaos Trams & Lt., 1st Deb. ..	100	5	5	87 — 90	..	5 11 1
Manila Elec. R. and Ltg., Bonds	$1000	5	5	97 —100	+1	5 0 0
Mexico Trams Com.	$100	7	7†	109 —111	+ ½	6 6 2
Do. Gen. Con. 5 % Bonds ..		5	5	92½ — 94½	— ½	5 5 10
Do. 6 % Bonds	100	6	6	98 —101	..	5 18 10
Para Elec. Rlys. & Lt., Ord. ..	5	10	10	7 — 7⅛	..	6 13 4
Do. 6 % Pref.	5	6	6	4⅞ — 5⅛	..	5 11 7
Do. 5 % 1st Deb.	100	5	5	99½ —101½	+ ½	4 18 6
Perth (W.A.) Elec. Tr., Ord. ..	1	5	5½	1⅜ — 1½	..	3 14 5
Do. 5 % 1st. Deb.	100	5	5	105 —108	..	4 12 7
Rangoon El. Tr. & Sup., Pref. ..	5	6	6	5⅜ — 5⅞	..	5 0 0
Do. 4½ % 1st Deb.	100	4½	4½	97 — 99	..	4 10 11
Rio de Janeiro Trams, 1st Mort. 5 % Bonds	..	5	5	101½ —102½	+ ½	4 17 9
Do. 5 % Mort. Bonds ..	100	5	5	95½ — 96½	+ ½	5 3 8
Sao Paulo Tram, Lt. and P. 5 % 1st Deb.	$500	5	5	101 —103	..	4 17 1
Singapore Trams, 5 % Deb. ..	100	5	5	83½ — 87½	..	5 14 3
Southern El. Tr. B.A., 5 % Deb.	100	5	5	96 — 98	..	5 2 0
Un. Elec. Trams Monte Video ..	5	7	6†	5 — 5½	..	6 7 3
Do. 6 % Pref.	5	6	6	4⅝ — 5⅛	..	5 11 7
Do. 5 % 1st Deb.	100	5	5	98 —101	..	4 19 0
Winnipeg Elec. Rly., 4½ % Deb.	100	4½	4½	99 —102	+ ½	4 8 3

MANUFACTURING COMPANIES.

Aron, Ord.	1	6	..	⅜ — ⅝	..	8 0 0
Do. 6 % Pref.	1	6	6	25/32 — 27/32	..	7 2 2
Babcock & Wilcox	1	28	16	3⅛ — 3⅜	—1/16	4 16 8
Do. Pref.	1	6	6	1⅛ — 1¼	..	4 0 0
British Aluminium, Ord. ..	1	Nil	..	7/16 — 1/2	..	..
Do. 6 % Cum. Pref.	1	Nil	6	5/8 — 3/4	..	5 17 2
Do. 5 % Prior Lien Debs. ..	100	5	5	93 — 96	..	5 4 2
Do. Deb. Stk.	100	5	5	84 — 87	..	5 14 11
B.I. & Helsby Cables	5	10	10	7⅜ — 8⅛	..	5 15 11
Do. Pref.	5	6	6	5⅝ — 6⅛	..	4 16 0
Do. Deb.	100	4½	4½	102 —104	..	4 6 7
British Thomson-Houston, Deb.	100	4½	4½	96 — 98	..	4 11 10
British Westinghouse, Pref. ..	8	Nil	Nil	⅜ — ⅝	..	Nil
Do. Deb.	100	4	4	62 — 66	..	6 1 8
Do. 6 % Prior Lien	100	6	6	98 —101	..	5 18 10
Browett, Lindley, Ord.	1	..	..	2/- —3/-	..	Nil
Do. Pref.	1	..	..	4/6 —5/-	..	Nil
Brush, 7 % Pref.	2	Nil	Nil	0 — ¼	..	Nil
Do. 5 % Prior Lien Deb. ..	100	5	5	73 — 78	..	6 8 2
Do. 4½ % Deb	100	4½	4½	38 — 43	..	10 9 4
Do. 4½ % Second Deb. ..	100	4½	4½	25 — 29	..	16 13 4
Callender's Cable	5	15	10†	11 — 11⅜	..	6 7 8
Do. Pref.	5	5	5	4⅞ — 5⅜	..	4 17 7
Do. Deb.	100	4½	4½	98 —101	..	4 9 1
Castner-Kellner	1	20	20	21½ — 21⅝	..	5 5 8
Do. Deb.	100	4½	4½	103 —106	..	4 4 11

Crompton & Co.	3	Nil	..	⅛ — ⅜	..	Nil
Do. Deb.	100	5	5	55 — 57	..	9 15 6
Dick, Kerr	1	5	Nil	3/16 — 5/16	..	..
Do. Pref.	1	6	6	1/16 — 3/16	..	..
Do. Deb.	100	4½	4½	94 — 97	−1	4 12 9
Edison & Swan, A, £8 paid ..	5	Nil	..	⅛ — ⅜	..	Nil
Do. fully paid	5	Nil	..	1¼ — 1½	..	Nil
Do. 4 % Deb.	100	4	4	61 — 65	..	6 3 1
Do. 5 % Second Deb.	100	5	5	70 — 73	..	6 17 0
Electric Construction	2	2½	3⅛	1⅛ — 1⅜	..	5 14 4
Do. Pref.	2	7	7	1⅞ — 2	..	7 0 0
Greenwood & Batley, Pref. ..	10	7	7	7⅞ — 8	..	8 5 8
Do. Deb.	100	5	5	92 — 94	..	5 4 2
General Electric, 6½ Pref. ..	10	5	6	10 — 10⅜	..	5 11 7
Do. Deb.	100	4	4	88 — 93	..	4 6 0
Henley's, Ord.	5	15	15	12½ — 12⅝	..	5 17 2
Do. Pref.	5	4½	4½	4⅝ — 5⅛	..	4 7 10
Do. Deb.	100	4½	4½	101 —103	..	4 7 5
India-Rubber, G. & T.	10	..	7½	10¾ — 11½	..	6 13 4
Do. Pref.	10	5	5	9 — 10	..	5 0 0
Telegraph Construction	12	17½	20	35½ — 37½	+1½	6 8 2
Do. Deb.	100	4	4	96 — 99	+ ½	4 0 10
Willans & Robinson	1	Nil	..	⅛ — ¼	..	Nil
Do. Pref.	5	Nil	..	⅜ — ½	..	Nil
Do. Deb.	100	4	4	67 — 69	..	6 15 7

* Unless otherwise stated, all share are fully paid. † Interim dividend. ‡ Dividend of 4 per cent. guaranteed by Underground Electric Railways.

Bank rate of Discount 4½ per cent., April 17th, 1913.

EXPORTS AND IMPORTS OF ELECTRICAL GOODS DURING MARCH, 1913.

The March returns of electrical business which we publish herewith, exhibit as regards the exports record-breaking figures, and as regards the imports, a small increase over those of the previous month.

Thus, the exports during March reached the highest total so far recorded by us, viz., £994,303, this being due, however, to the inclusion of a huge telegraphic export to Ceylon valued at over £450,000, and bringing the telegraphic export for the month up to over half a million pounds in value.

It is interesting to note that the highest export value previously recorded by us was approximately £874,000 in March, 1910, while in March last year a total of some £821,000 was recorded. In the case of this month's figures, it is satisfactory to note that even excluding the large telegraphic total, the balance representing the usual run of business amounted to over £480,000 in value—a very high total, which included over £168,000 worth of machinery, £96,000 worth of telephonic material, and £91,000 worth of cables, the latter section, however, comparing with some £106,000 worth in the previous month, and showing the only marked decrease as compared with the February figures.

The imports reached £253,412 in value, as compared with £236,079 in the previous month, increases in value being fairly general in all sections except those representing glow and arc lamps. The re-exports at £23,723 were fractionally higher than in February. Ceylon naturally heads the list of purchasers this month, but probably of more general interest are the high figures recorded for Argentina, New South Wales, Canada, India, Japan, &c., due to normal trade.

Registered Exports of British and Irish Electrical Goods from the United Kingdom.

Destination of exports and country consigning imports.	Electrical goods and appliances.	Wires and cables, rubber and other insulations.	Electric lighting fittings and accessories.	Electric glow lamps.	Electric arc lamps and lamp parts.	Electric meters and instruments.	Electric machinery.	Electrically-driven machinery.	Batteries and accumulators.	Carbons.	Telephonic cable and apparatus and electric bells	Telegraphic cable and apparatus.	Total.
	£	£	£	£	£	£	£	£	£	£	£	£	£
Russia, Sweden, Norway and Denmark ...	823	...	10	207	40	265	5,725	1,281	5	72	324	354	9,106
Germany	1,714	1,561	25	37	623	12	3,004	709	139	49	6	3,528	11,407
Netherlands, Java & Dutch Indies	1,038	1,804	228	13	36	...	1,360	200	...	...	50	4,177	8,906
Belgium	1,954	354	183	75	185	26	2,088	507	11	20	1,309	9	6,721
France	888	...	3,589	...	15	18	10,844	156	...	87	381	191	16,169
Portugal	59	935	33	46	...	...	91	...	...	...	355	107	1,626
Spain, Canary Isles and Spanish N. Africa...	2,002	3,985	53	14	...	992	4,367	...	...	...	635	401	12,449
Switzerland, Italy and Austria-Hungary ...	678	466	125	...	63	...	6,019	680	...	342	...	620	8,993
Greece, Roumania and Turkey	208	68	129	11	...	...	600	...	53	52	...	6,110	7,231
Channel Isles, Gibraltar, Malta and Cyprus...	197	127	32	117	...	71	272	120	901	...	...	249	2,086
U.S.A., Philippines and Cuba	418	226	364	175	...	37	583	...	2	...	...	147	1,952
Canada and Newfoundland	756	1,555	1,279	511	13	2,546	13,507	52	1,784	16	20,335	386	42,740
British West Indies, British Honduras and British Guiana	337	...	22	221	27	58	293	...	...	...	111	16	1,085
Mexico and Central America	10	23	39	38	24	...	63	...	2	...	...	...	199
Peru and Uruguay	143	226	...	112	...	...	590	10	11	...	...	32	1,124
Chile	372	1,816	1,670	505	480	208	5,367	268	936	126	118	5,524	17,384
Brazil—	547	811	1,643	227	151	102	5,089	780	703	...	6,428	6,259	22,740
Argentina	3,750	20,507	1,673	619	272	471	11,111	3,934	4,234	1,564	14,606	8,236	70,977
Colombia, Venezuela and Bolivia	357	72	23	33	...	...	999	...	125	...	36	18	1,663
Egypt, Tunis, Morocco and Persia	399	45	96	...	23	15	1,589	388	197	...	632	569	3,953
British West Africa and Congo Free State	188	227	552	11	16	55	148	...	5	...	12	108	1,322
Rhodesia, O.R.C. and Transvaal	2,728	786	205	1,137	...	605	4,919	583	1,029	8	484	302	12,786
Cape of Good Hope	2,353	3,787	719	1,072	95	463	6,865	680	2,590	5	5,432	4,284	28,345
Natal	1,064	9,999	285	378	60	5	6,387	...	1,643	...	117	867	20,805
Zanzibar, Brit. E. Africa, Mauritius & Aden	148	76	34	163	...	580	537	70	102	...	38	189	1,937
Azores, Madeira and Portuguese Africa ...	106	701	222	99	...	733	4,230	...	...	...	25	142	6,258
China and Siam	1,374	628	1,925	1,180	...	40	2,759	...	378	...	202	325	8,811
Japan and Korea	637	8,102	110	39	35	487	14,117	1,701	2,490	55	71	4,848	32,692
India	4,125	10,915	2,863	2,139	63	1,601	10,396	3,851	2,553	466	2,743	840	42,555
Ceylon	73	765	82	41	...	464	1,715	381	163	...	106	454,156	457,946
Straits Settlements, Fed. Malay States, British Borneo and Sarawak	667	2,134	124	81	28	51	1,014	575	56	...	610	1,062	6,402
Hong Kong	390	810	200	128	17	10	110	...	37	235	187	69	2,193
West Australia	512	1,640	53	219	...	25	620	241	25	...	49	683	4,067
South Australia	796	1,223	228	199	44	844	378	...	497	53	90	200	4,552
Victoria	2,214	4,518	829	1,823	18	1,777	7,718	633	1,747	...	2,969	709	24,955
New South Wales	3,095	2,101	490	1,272	97	853	17,696	760	1,593	28	36,968	2,379	67,332
Queensland	114	1,400	91	159	...	81	929	...	135	...	...	...	2,909
Tasmania	20	...	...	...	15	385	180	...	48	...	309	...	957
New Zealand and Fiji Islands	1,185	6,791	797	361	...	475	5,271	830	1,002	18	396	1,842	18,968
Total, £	38,439	91,178	21,025	13,462	2,440	14,355	159,550	19,390	25,196	3,196	96,134	509,938	994,303

Registered Imports into the United Kingdom of Electrical Goods from all Countries.

Russia, Norway, Sweden and Denmark ...	...	160	...	58	8	...	4,473	760	516	24	6,825	12,824
Germany	10,216	21,195	1,763	10,539	6,951	3,144	73,028	7,638	2,239	6,662	7,864	151,239
Holland	30	...	...	458	944	...	227	...	...	7	92	1,758
Belgium	1,633	4,718	104	120	385	8	2,683	43	61	40	5,262	15,057
France	371	1,000	1,118	776	600	1,212	1,032	...	297	4,133	3,849	14,388
Switzerland	187	1,406	52	3	26	301	459	...	62	94	...	2,590
Italy	...	4,085	...	...	14	...	668	...	...	...	85	4,852
Austria-Hungary	...	947	...	362	102	...	795	...	34	860	...	3,040
United States	4,762	549	656	14	119	83	14,092	25,520	330	27	727	46,879
Canada	93	...	...	...	...	...	60	...	...	...	10	163
Total, £	17,292	34,060	3,693	12,270	9,149	4,748	97,517	33,961	3,539	11,847	24,714	252,790

Additional imports: Spain, carbon, £622.

Registered Re-Exports of Foreign and Colonial Electrical Goods from the United Kingdom.

Various countries, mainly as above ...	11,857	1,364	...	1,511	610	...	6,605	...	159	414	1,203	23,723

TOTAL EXPORTS: £994,303. TOTAL RE-EXPORTS: £23,723. TOTAL IMPORTS: £253,412.

NOTE.—The amounts appearing under the several headings are classified according to the Customs returns. The first and third columns contain many amounts relating to "goods" otherwise unclassified, the latter, doubtless, consisting of similar materials to those appearing in adjacent columns. Imports are credited to the country whence consigned, which is not necessarily the country of origin.

IMPORT TRADE STATISTICS OF SWITZERLAND.

The following figures of the imports of electrical and similar goods into Switzerland in the year 1911 are taken from the recently issued official trade statistics; the figures for 1910 are added for purposes of comparison, and notes of increases or decreases are given. Attention should be called particularly to the predominant position of German trade as contrasted with the practically insignificant British share in most lines:—

	1910. Francs.	1911. Francs.	Inc. or dec. Francs.
Electric cable not insulated.—			
From Germany	28,000	28,000	—
„ France	14,000	19,000	+ 5,000
„ Other countries ...	1,000	—	— 1,000
Total ...	43,000	47,000	+ 4,000
Electric cable insulated with rubber or paper.—			
From Germany	109,000	90,000	— 19,000
„ Great Britain ...	4,000	5,000	+ 1,000
„ Other countries ...	13,000	14,000	+ 1,000
Total ...	126,000	109,000	— 17,000
Cable ditto covered with lead.—			
From Austria	—	43,000	+ 43,000
„ Germany	17,000	2,000	— 15,000
Total ...	17,000	45,000	+ 28,000
Cable insulated with rubber or paper and covered with textiles.—			
From Germany	174,000	192,000	+ 18,000
„ Other countries ...	12,000	18,000	+ 6,000
Total ...	186,000	210,000	+ 24,000
Cable ditto covered with lead.—			
From Germany	67,000	95,000	+ 28,000
„ Other countries ...	—	5,000	+ 5,000
Total ...	67,000	100,000	+ 33,000
Steam boilers of iron or steel.—			
From Germany	1,563,000	1,995,000	+ 432,000
„ France	191,000	177,000	— 14,000
„ Belgium	15,000	24,000	+ 9,000
„ Great Britain ...	62,000	31,000	— 31,000
„ Other countries ...	23,000	22,000	— 1,000
Total ...	1,854,000	2,249,000	+ 395,000
Dynamo-electric machines and electric transformers.—			
From Germany	1,106,000	921,000	— 185,000
„ France	24,000	38,000	+ 14,000
„ Italy	57,000	23,000	— 34,000
„ Great Britain ...	2,000	3,000	+ 1,000
„ Other countries ...	27,000	32,000	+ 5,000
Total ...	1,216,000	1,017,000	— 199,000
Steam engines, locomobiles, steam turbines, &c.—			
From Germany	447,000	228,000	— 219,000
„ France	26,000	10,000	— 16,000
„ Great Britain ...	41,000	55,000	+ 14,000
„ Other countries ...	7,000	7,000	—
Total ...	521,000	300,000	— 221,000
Gas, petrol, benzine, &c., motors.—			
From Germany	188,000	192,000	+ 4,000
„ France	199,000	180,000	— 19,000
„ Italy	22,000	13,000	— 9,000
„ Great Britain ...	28,000	17,000	— 11,000
„ United States ...	33,000	50,000	+ 17,000
„ Other countries ...	6,000	15,000	+ 9,000
Total ...	476,000	467,000	— 9,000
Accumulators, batteries, electrodes.—			
From Germany	186,000	196,000	+ 10,000
„ Austria	53,000	48,000	— 5,000
„ France	35,000	37,000	+ 2,000
„ Other countries ...	25,000	16,000	— 9,000
Total ...	299,000	297,000	— 2,000
Insulators, mounted.—			
From Germany	59,000	60,000	+ 1,000
„ France	3,000	3,000	—
„ Other countries ...	4,000	2,000	— 2,000
Total ...	66,000	65,000	— 1,000
Electric meters.—			
From Germany	920,000	1,108,000	+ 188,000
„ France	65,000	67,000	+ 2,000
„ Italy	15,000	21,000	+ 6,000
„ Great Britain ...	16,000	10,000	— 6,000
„ United States ...	28,000	14,000	— 14,000
„ Other countries ...	6,000	20,000	+ 14,000
Total ...	1,050,000	1,240,000	+ 190,000
Telegraph and telephone apparatus.—			
From Germany	368,000	300,000	— 68,000
„ Belgium	163,000	165,000	+ 2,000
„ Great Britain ...	—	68,000	+ 68,000
„ Sweden	58,000	20,000	— 38,000
„ Other countries ...	10,000	36,000	+ 26,000
Total ...	599,000	589,000	— 10,000

Note.—25 francs = £1.

MUNICIPAL ELECTRICITY IN SHANGHAI.

We have received from Mr. T. H. U. Aldridge, the electrical engineer to the Shanghai Municipal Council, an interesting report on the work of the electricity department for the year 1912.

From this it appears that the revenue for the year was 761,490 taels (tael = 2s. 6d. approximately); the balance to net balance 238,425 taels; and the net profit 62,318 taels, after allowing a sum of 50,000 taels for special depreciation on the Fearon Road generating plant. A sum of 24,476 taels was also included under revenue payments, being expenditure on interest and salaries in respect of capital works in connection with the new Riverside station, which will not be in regular use for some months. The cost of the Fearon Road generating station is to be written off during the next seven years, and this will, of course, reduce the net surplus for some years to come; the department has, moreover, during the past five or six years reinvested profits to the extent of 500,000 taels in the purchase of new plant and is in a strong position financially.

To turn to engineering details, the plant capacity at Fearon Road was 6,400 KW., of which 1,200 KW. was direct-current plant for traction supply. The maximum load was 6,000 KW., a 48 per cent. increase on the previous year, and was largely due to the great number of new lighting consumers, mostly Chinese, connected during the year, although, of course, also due to power and heating supplies increasing.

The units sold and accounted for were 12,130,537, including nearly 5½ million for private lighting, 940,000 for public lighting, 118,585 for heating and cooking, 2,300,000 for power, and 2,860,000 for traction. The total for the previous year was 8,300,000 units, and the estimated total for the present year is 20 million, an enormous jump which shows plainly the astonishing development in electrical matters in Shanghai.

The load factor was 23·5 per cent., or practically unchanged from the previous year, and the coal per unit sold was 5 lb.

The new Riverside generating station will be brought into use during the year, adding some 4,000 KW. of plant capacity to help the estimated maximum load of 8,300 KW. next winter.

For the winter of 1914 a load of 11,300 KW. is anticipated, and it is, therefore, proposed to add, this year, four more boilers, two additional 5,000-KW. turbo-alternators, and additional trunk feeders between the new and old stations.

During the year 102 miles of overhead cable were erected, and 13¾ miles of three-phase cable laid; nine new sub-stations were built, three of them designed to accommodate 1,000 KW. each, and the aggregate transformer capacity installed is now 7,500 KW.

The public lighting now includes 292 arc and 833 metal-filament lamps, the latter varying from 60 to 400 C.P. The total service connections at the end of the year were 6,870, 2,200 being added during 1912, and the report points out that the fact that lamp connections show an increase of only 26 per cent., is an indication that electric lighting is cheap enough in Shanghai now to attract the poorer class of Chinese consumer. The small consumer is relatively profitable in Shanghai owing to the comparatively cheap overhead distribution and service costs.

Bearing on this point the report says:—"It is noteworthy that a large class of consumer which is now being secured is found amongst those who, until using electricity, have been lighting their premises with oil lamps." "The transition from oil to electricity . . . . is found in what might be called the poorer classes of Chinese shops as well as the better ones." "Electricity as an advertising medium is at last being fully recognised by the Chinese. . . . . "Then, again, a great number of houses in native alleys are being connected, from which source an enormous demand for electricity is anticipated in the near future."

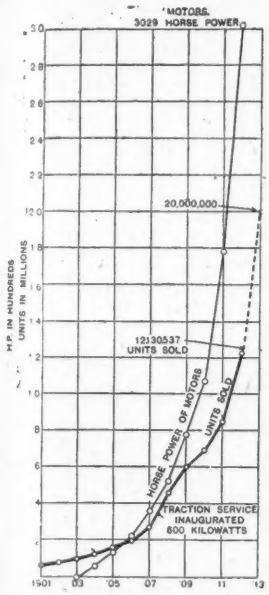
Electric heating and cooking apparatus are hired out by the department at a small monthly rental, and in this direction great progress is being made, the year's connections amounting to 293 KW., bringing the total connections to 674 KW.

Naturally, it is in the direction of power supply that the greatest progress has been made, and the report adds, "It is nothing to what we may expect within the next few years.

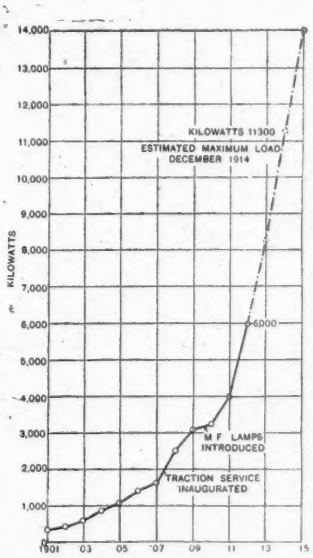
"Already in Shanghai there is a very large field for the electrification of mills and factories . . . . and there is every likelihood of large mills being erected, . . ."

During the year, 1,254 H.P. of motors were added, making a total of 305 motors of over 3,000 H.P. now connected. Many of the older rice mills have substituted electric driving, while new ones commence by installing the electric drive. One sub-station already supplies over 500 H.P. for this purpose. In July last a cotton mill containing 10,000 spindles was connected to the mains and is electrically driven throughout. Contracts have been signed for other cotton mills for 1,200 H.P., and negotiations are pending for over 2,500 H.P. for other mills. Indeed, one has only to note that the power units increased from 760,000 in 1911 to 2,300,000 in 1912 to judge of the developments in this direction.

The report also refers to the opportunity for introducing the electric vehicle in Shanghai, to which Mr. Aldridge is now giving his attention.



Units sold and motor H.P. connected.



Maximum load curve.

Shanghai Electricity Supply.

In conclusion, we reproduce one or two curves which speak volumes for the great progress being made in electricity supply in Shanghai; it is not too much to say that this state of affairs is due more than anything to the enterprise of Mr. Aldridge, the Council's electrical engineer, who, despite the difficulty of location, has succeeded in placing this Chinese city on an equal footing in electrical matters with the best municipal electrical undertakings at home.

PROCEEDINGS OF INSTITUTIONS.

Electric Supply in London.

By Frank Bailey, M.Inst.C.E.

(*Abstract of paper read before the* Society of Arts, *April 9th*, 1913.)

(*Concluded from page* 663.)

We have now dealt with the electrical supply works, and may turn, for purposes of comparison, to the other supplies of public utility—gas and water.

The position of the various gasworks and distributing centres is shown by the diagram. The position of the gas companies, according to Field's analysis of accounts for the year 1911, is given below.

	Nominal capital.	Sale of gas. 1,000 cb. ft.
Commercial Co.	£2,606,065	£3,295,000
Gas Light and Coke Co. ...	29,154,146	25,485,000
South Metropolitan Co. ...	8,325,340	12,604,000
South Suburban Co.	831,363	1,455,000
Wandsworth and Putney Co. ...	548,262	1,161,000
	£41,465,176	44,000,000

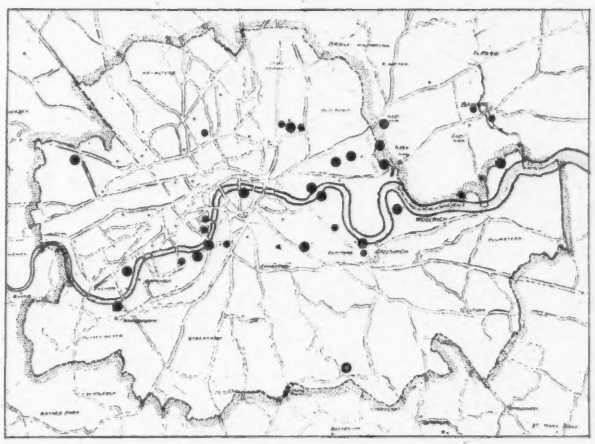
All these companies are not subject to any powers of purchase, and have unlimited tenure, holding a practical monopoly in their respective districts, but under terms of statutory supervision and limitation of dividends by the operation of a sliding scale, which form the most ideal protection for the public and the best encouragement for business enterprise.

The supply of water is similarly obtained from a number of sources, and distributed from many reservoirs. In 1904, the Metropolitan Water Board acquired by purchase the undertakings of the original eight water companies for the sum of 47¼ million pounds, and now supply about 82,000,000 thousand gallons per annum.

It will thus be seen that the capital expended at the present time on electrical undertakings is approximately one-half of that spent on gas and water respectively.

The system of mains adopted throughout London is one of the most perfect examples to be found in any city, although it is not the cheapest. Lead-covered cables, insulated with oil-impregnated paper, are generally employed, and these cables—of which there is now more than 20 years' experience—actually improve with age; so long as the lead covering remains undamaged, there appears to be no limit to the useful life of the cable. Dr. Ferranti was the first advocate and maker of this type of cable in the form of concentric conductors, and thus earned the title of the pioneer of electrical transmission.

The brilliance of the tungsten lamp, accompanied by the low cost of obtaining increased candle-power, has raised the standard of domestic illumination and created a demand for more light. An electric supply is now essential to secure the greatest convenience in carrying out the ordinary domestic work of the home. Electric



Gas Works in the London Area.

radiators, chiefly of the luminous type, have brought comfort to many offices in the City of London. Electric ozonisers have proved their utility in purifying bad air and water. The electric vehicle may also become more generally used in this country. The increasing use of the electric motor for all purposes is a convincing proof of its advantages.

The following details taken from individual typical examples may be interesting:—

	Kilowatts connected.	Cost of supply per annum.
Printing (Newspaper)	1,036	£1,812 2 6
„ (General)	56	119 7 11
Box makers	9	80 0 10
Chemists	92	221 11 4
Brewers	39	153 10 6
Paint factory	108	253 2 11
Soap makers	110	68 15 9
Glass „	18	118 16 0
Blouse „	13	89 6 4
Wood wool makers	166	623 8 6
Packing case „	52	214 17 10
Tailors	63	159 15 5
Biscuit factory	265	419 2 6
Confectioners	174	569 11 9
Rubber factory	222	219 16 5
Sawmill	79	302 8 2
Spice factory	69	371 4 4
Cabinet maker	87	302 15 2
Ironfounders	150	877 14 2
Vinegar brewery	15	201 14 10
Marble masons	101	294 2 0
Tobacco manufacturers ...	22	138 3 5
Cold store	164	922 2 9
Flour mills	51	158 15 11
Ink „	48	235 2 10

The average cost for each kilowatt connected in the representative cases given in this table works out at £2 15s. 8d. per annum, or per horse-power, say, £2 1s. 6d. per annum. Had this horse-power been obtained from the old-fashioned engine, with the losses in shafting, belting, and steam pipes, starting up the plant and keeping the boilers warm all night, and the additional labour required, the cost would have been from £6 to £8 per annum, with further costs for continual repairs and all the annoyance of running steam plant taking up more room than it was worth.

We now come to the important question of street lighting. The development and perfection of the motor vehicle has resulted in an increased speed of street traffic, with many advantages though with some danger. Quicker transit has added to the prosperity of those who formerly suffered loss of time by blocks in the traffic; the delivery of goods is facilitated; and the expensive widening of

many streets is no longer necessary, as by doubling the speed it follows that twice the amount of traffic can be accommodated. To maintain safely this increased speed during hours of darkness a higher standard of artificial illumination has become necessary. A motor vehicle approaching at a speed of 20 miles an hour covers nearly 10 yards in one second, and, travelling without noise, leaves only the power of vision to protect the pedestrian. The adequate illumination of all thoroughfares will reduce the necessity of each vehicle carrying a searchlight and sidelights, or practically forming a travelling lighthouse.

The electric lighting of Cheapside is, like that of many of the main thoroughfares in the City of London, carried out by flame arc lamps, centrally suspended from steel ropes stretched across the street and placed at a considerable elevation in order to secure freedom from shadow and glare.

Improved street lighting is receiving consideration by the various borough councils in London, and their engineers and surveyors have recognised the value of better illumination, not only to ensure the safety of night street traffic, but also to improve adjoining property and to assist the police.

The London County Council now possess powers of purchase of the company undertakings in 1931, and after that date at recurring periods of 10 years—with the exception of the City of London where the Corporation have a prior right which expires in 1914. The terms of purchase are "the then value of all lands, buildings, works, materials and plant, suitable to and used for the purposes of the undertaking, provided that the value of such lands, buildings, works, materials and plant shall be deemed to be their fair market value at the time of the purchase, due regard being had to the nature and then condition of such buildings, works, materials and plant, and to the state of repair thereof, and to the circumstance that they are in such a position as to be ready for immediate working, and the suitability of the same to the purposes of the undertaking . . . . but without any addition in respect of compulsory purchase or of goodwill."

These terms were practically based on Sec. 43 of the Tramways Act, 1870, and evidently provide for a fair market price for an undertaking in working order. The recent award in the arbitration proceedings to ascertain the sum to be paid by the Post Office for the acquisition of the National Telephone Co., may therefore be referred to with some interest, particularly as the terms of purchase were on the same lines, though with variations much in favour of the electrical supply undertakings. The Telephone Co. claimed £18,325,435, were awarded £12,515,264 (subject to certain adjustments which are at the moment *sub judice*), and had provided reserve funds which reduced their capital expenditure to £12,473,627.

The total capital expended by all the companies up to the end of 1912 will be found in the table given below, under the various items which appear in the standard form of accounts.

It should be noted that the Willesden works of the Metropolitan Electric Supply Co., being outside the boundary of the County of London, are not subject to purchase by the London County Council

Summary of Total Capital Expenditure of all Electric Supply Companies in London, 1912.

	Amount expended, Dec. 31st, 1912.
Land and buildings	£3,162,555
Plant and machinery	3,935,310
Tools and appliances...	40,124
Accumulators...	123,908
Transformers	539,531
Mains	5,349,304
Meters, instruments, &c.	625,427
Motors, &c., on hire	93,274
Public lighting	65,827
Station fittings, &c.	28,195
Offices and furniture, &c.	42,423
Distributing stations	113,607
Wells (artesian)	6,530
Preliminary expenses	487,181
	£14,613,196

under the terms as quoted above, but may be purchased by agreement. The Bow works of the Charing Cross and City Co. are also subject to purchase under special conditions.

If we consider that money has to be found by the companies to provide for the necessary capital outlay required to develop further such an important industry, and that the Act of 1908 authorises the London Council to advance money only for three years prior to 1931, it will be seen that for the next 15 years the interests of shareholders will require close attention, and that works of development will require strict economy, coupled with immediate return of some profit, to avoid a loss of capital to those who have encouraged and practically founded a new industry.

As regards conditions of supply and rates of charge, we sometimes hear suggestions that other cities either show more progress or obtain their light or power at a lower cost.

The average price in London for the year 1910, given in the statistics issued by the London County Council, was 3·42d. per unit for lighting and 1·16d. for power, or a general average of 1·54d. per unit, including meter rents.

I have ascertained from Chicago (population 2,250,000) that in the year 1912 they sold 141,752,000 units for lighting at an average selling price of 5·85 cents, say, 3d.; and 86,875,000 units for power at an average price of 3·88 cents, say, 2d. The total sale of 228,627,000 units gives an average of, say, 2·62d. per unit.

In the case of Berlin (population 2,072,000) the municipality granted a monopoly, under strict control, to private enterprise on terms of paying 10 per cent. of the net receipts, to be increased to 25 per cent. when the dividend exceeds 6 per cent. At the end of 30 years from the date of the concession the municipality may purchase the undertaking at its full then value, but without goodwill; and terms are also provided for earlier determination on payment of substantial premiums on the then value. The four original works—Markgrafenstrasse (1885), Mauerstrasse (1886), Spandauerstrasse (1889), and Schiffbauerdam (1890)—were limited by an agreement to an output of about 21,000 KW., and rapid development compelled the erection of the first transmission works at Moabit, followed in 1899 by the Oberspree power house, which supply many of the suburbs; and in 1910 the Rummelsburg works were erected.

The rates of charge in Berlin are:—For lighting, 40 pfennige per KW.-hour, with a minimum charge of 100 KW.-hours per annum, say, 4·7d. per unit. For power, 16 pfennige, with a minimum charge of 400 KW.-hours per annum, say, 1·88d. per unit. In addition, there are charges for fixing and hire of meter and for the cost of the house connection, with a further charge for the compulsory inspection of wiring at the rate of 4 per cent. on the actual cost of the installation. The total sale for the year year 1911-12 was as follows:—

	Units.	
Lighting	54,260,000	Maximum demand, 94,570 KW.
Power	75,650,000	
Railways	69,850,000	
Bulk	23,610,000	
Total ...	223,370,000	

Paris (population 2,847,000) commences a new and sole concession on January 1st, 1914, to the Compagnie Parisienne de Distribution d'Electricité, under interesting conditions, and in the meantime the six old companies are preparing to be absorbed, and two new power works—one of 50,000 KW. at St. Ouen, near St. Denis, and the other of 25,000 KW. at the Moulineaux—are now in operation. The conditions include payment of 10 per cent. per annum of gross receipts, nominally as a rental for the portion of the distributing system which now belongs to the municipality, with a sliding scale increasing this rent, the minimum annual payment being £120,000. The lease terminates in 1940, when all property will be taken over by the municipality without payment, and power is reserved to acquire the undertaking in 1924 on payment of the balance not then provided by the statutory sinking fund. The authorised rates of charge are 4·8d. per unit for lighting, and 2·9d. for power.

The experience of Buenos Ayres is interesting, as this important town of 1,500,000 inhabitants was formerly supplied by a number of companies, who allowed the prosperity following their pioneering work to fall into other hands. The Allgemeine Co., of Berlin, assisted by the Deutsche Bank and the Berliner Handelgesellschaft, formed the German Overseas Electrical Co., which started the Compania Alemana Transatlantica de Electricidad in 1898, and obtained certain rights from the municipality for an indefinite time to lay electric cables throughout an important district. New works in the Calle Paraquay of about 5,000 KW. were started in 1899; and the next year the Cia. Generale d'Electricité were absorbed, to be followed by the River Plate Co.; the Boca works of the Anglo-Argentine Tramways Co., Ltd.; the Edison works of the Primitiva Gas Co.; and, finally, in 1905, the works of the Cia. de Traccion y Electricidad "La Capital" were taken over. The Boca works were enlarged by the addition of steam turbines to a total capacity of 30,000 KW.; and in 1910 a large power house at Dock Sud was completed, and now contributes a total capacity of 40,000 KW., with further extensions in hand. It is probable that the value of the shares in the old undertakings was not realised until control had passed into the hands of the exploiting company, and by adopting steam turbines the undertaking was soon prosperous. The terms of the concession provide for repayment of capital by the municipality less an allowance for depreciation, and this accounts for the fact that much of the old plant is still visible, and it may also lead to a renewal of the lease rather than to acquisition by the municipality on such onerous terms.

We can now see that no large city in other countries entrusts its electrical supply to municipal enterprise, and debates on the subject in various languages always repeat the arguments with which we are familiar. The final question of municipal trading *versus* controlled monopoly has been settled with advantage to the various municipalities, by allowing them some return on the profits; by limitation of dividends on a sliding scale, in which the consumer benefits; and by conditions of tenure.

The present and future prospects of the company undertakings in London provide some possibility of undesirable speculation; the uncertainty of a purchase clause may encourage pessimist rumours to depress the property, to be followed by equally good reasons for a convincing boom to the delight of the speculator. We have seen the interpretation of a similar, though weaker, purchase clause, and shareholders may be well advised to remember Buenos Ayres, and to place some confidence in the justice of the ultimate arbitrator.

The local authority undertakings in London have overcome many of the difficulties thrust upon them. Losses are met by special levies included in the rates, and profits provide some controversy as to their disposal. Contracting work, such as wiring buildings, &c., is objected to by the trade, and the expenses of advertising are not always allowed by the authorities. The technical and other officers work under the disadvantage of continual change in

administration; but, in spite of difficulties of all kinds, the electrical engineers of the Borough Councils have generally not only made their plant work, but have obtained the thanks of their customers, credit for themselves, and appreciation from their Councils, although the latter is not always expressed in a convincing manner.

In conclusion, may I be allowed to express a hope that the next paper on the subject—to be read, say, 20 years hence—will prove that the substantial progress made up to the present time was a sure indication of further great developments and the more extensive use of electrical supply. The difficulties of the past few years have created an army of skilled engineers, who have developed powers of resource, and the ability to look ahead; and, as they are mostly still young, they will, I hope, live to realise that they assisted to create an industry which, while increasing the luxury of the rich, reduces the poverty of the poor, and brings prosperity to the nation.

The Chairman (Mr. A. A. Campbell Swinton) opened the discussion by commenting upon the interesting and exhaustive character of the paper. There could be no doubt that the author was, of all men, best equipped for writing such a paper. The speaker recalled that in 1887, when he first came to London, he met the author for the first time; the author was at that time putting up an underground generating station just outside Whitehall Court, which was now, he believed, used as a sub-station. Since that date Mr. Bailey had been continuously in the electric supply industry of London, and was the first station engineer to apply steam turbines, showing admirable courage in so doing. The speaker had had considerable experience of steam turbines—an experience which, in fact, antedated the time referred to. He believed that the first steam turbines used in London, which still existed, although no longer in use, were two very small turbines employed in connection with the lighting of Lincoln's Inn Hall. In May, 1890, there had been installed under the speaker's supervision, some steam turbines for supplying electricity to New Scotland Yard, and these turbines were still at work, and the entire lighting and power—a considerable amount of printing and other work was carried on there—were supplied by these radial flow turbines, which had been running for 23 years. One of these turbines had been opened up last year, and despite the fact that its interior had not been inspected for 10 years, nothing was amiss, and it was put together again. Turning to the future of so great an industry, the aspect of affairs, was not without seriousness. What would happen, he would ask, for some years before the London County Council made the contemplated purchase? There would probably be great difficulty in finding capital, towards the close of the present companies' period of holding, for extensions; that was one of the evils of eventual municipal purchase upon the terms arranged for in the Electric Lighting Act. People would cease to find money for investment in a concern liable to be bought up at a very low price within a few years, and, in the speaker's opinion, the last Electric Lighting Act had not adequately provided for the difficulty which would arise in a few years' time.

Mr. W. M. Mordey congratulated the author upon having given a second paper after a lapse of some 23 years, and hoped that, at the end of a similar period, he would give the survivors of the present audience the third paper to which he had referred.

Mr. James H. Rosenthal said it was stated in the paper that the Babcock Co. had done much service in perfecting the chain-grate stoker, to which he would add that Mr. Bailey had himself contributed quite as largely to the development of that detail. He had had experience in foreign stations, municipal and other, nearly all over the world, and he did not consider that municipal stations were in any way better than those managed by companies. Probably municipalities would find it no less difficult than companies to raise money, for which reason he doubted whether the County Council would take advanage of their purchasing powers.

Mr. W. C. P. Tapper said that the author of the paper had been chairman of a Committee of Engineers representing both companies and local authorities, appointed to consider the question of the future supply of London and to report on the matter. Of this Committee the speaker had been a member. He approved of the principle of central control, which must take place sooner or later. Whether, however, that central control would be effected by the London County Council or by some large company, he could not say. One difficulty would arise from the fact that the London County Council, although able to take over the complete systems of the companies, could not take over those of the local authorities; neither could any single large company do this. Assuming, moreover, that legal difficulties were removed, it would seem that the first matter to be settled would be the requisite standardisation of the system of generation. He thought it likely that a three-phase 50-period system at 6,000 volts pressure would be adopted by reason of its convenience for generating direct current, while should higher voltages be required for long distances, step-up transformers could be resorted to. He did not agree with the view that the whole of the 88 stations should be further developed. A good many of the existing stations had water facilities, in the way of canal or river, and might be developed up to their economical limits. When these were fully occupied, six or seven of the better-placed stations should be selected for further development. Extension should then be confined to such stations, the remainder gradually becoming distributing stations. The steam plant of existing stations could be run at peak load until such time as it paid to scrap it. Such an arrangement would serve for many years to come, and could be easily handled by a central authority. The question of purchase should be of interest to the consuming public as well as to supply engineers. The case of the Water Board, however, showed that public interest was sometimes aroused too late. When the Act constituting the Water Board was under consideration the consuming public took very little interest in the matter, with very unfortunate results. The purchase price in the case of the Water Board was too high, and a similar danger was likely to exist with regard to the electric supply industry in 1931. It was very important that consideration should be given to the payment of a reasonable purchase price at the proper time. From the tables given by the author, it appeared that the price charged by local authorities was less than in the case of companies; that should in no way discredit the companies, as these had done all the pioneer work.

Mr. Leon Gaster said that the future prosperity of electric lighting was bound up with the study of scientific methods of illumination, and considerable progress was now being made. He had recently visited many of the chief Continental and American cities, and he believed that if the lighting of the City were completed on the present lines it need not fear comparison with any of them.

Mr. A. H. Law said that Sir Charles Parsons had always appreciated the enterprise displayed by Mr. Bailey at the time when the first steam turbine was installed at Manchester Square; without that enterprise, the progress of the steam turbine might well have been delayed. With regard to the power supply of London, even if concentration were not advisable, some form of communication would appear to be useful, so as to enable the different companies to keep down their capital cost. He believed that some such idea occupied Mr. Bailey's mind when he installed the single-phase 100-period alternators, as he had then requested the designers to consider the possibility of future adaptation to three-phase 50-period work.

Mr. G. W. Mascord anticipated that within the next 20 years the supply of electricity and its application in workshops, &c., would be trebled. As an illustration of the advantage of electricity over steam, he would say that, in changing from steam to electric power, there had been a saving of 35 per cent. in expenditure. The old steam engine had been replaced by a large motor, but in the first stage it had been necessary to couple the motor to the existing shafting, and it was found that the energy absorbed by the shafting and belting was about 35 per cent. of the whole. The displacement of boilers and engines added 50 per cent. to the productive plant.

Mr. Bailey, in reply, said it had been a source of satisfaction to him to be able to bring up to date the figures which he had given 23 years ago.

Standard Clauses for Street Lighting Specifications.

By A. P. Trotter.

(*Abstract of paper presented at a meeting of the* Illuminating Engineering Society *on April 15th*, 1913.)

A Joint Committee consisting of members of the Institution of Electrical Engineers, the Institution of Gas Engineers, the Institution of Municipal and County Engineers and the Illuminating Engineering Society in 1911 commenced the consideration of a draft specification for street lighting, and it was provisionally agreed that the specification should be based on illumination, the standard of comparison to be the minimum horizontal illumination at a height of 3 ft. 3 in. above the ground level. Several members of the Committee objected to the choice of illumination instead of candle-power, and it was agreed that the present author shou'd prepare a statement supporting the former, while Mr. H. T Harrison should prepare a statement of objection to it. An attempt will be made to present and to amplify the two statements and to discuss the general subject in as impartial a manner as possible.

During the last few years, a real necessity for better street lighting has arisen, owing to the increasing speed of motor traffic. Neither the gas nor the electrical engineer is afraid of competition; on the contrary, they thrive on it, and the public gains more than anybody.

Illumination depends on the quantity of light falling on or received by a surface. It has nothing to do with the colour or reflecting power of a surface. A surface facing a source of light of 1 c.p. and at a distance of 1 ft. from it, or 16 c.p. at 4 ft., or 100 c.p. at 10 ft., receives unit illumination, and this is called 1 foot-candle.

The brightness of an unpolished surface depends on two factors—the illumination, and the proportion of light which the surface can reflect. A dark grey surface reflecting 5 per cent. of the light falling on it may have exactly the same appearance as a pale-grey surface reflecting 25 per cent. if the former receives five times as much illumination as the latter. The quality called brightness (or surface-brightness, to distinguish it from the intrinsic brightness of a self-luminous or translucent body) is, therefore, a product of the two factors illumination and the coefficient of diffused reflection.

If the illumination is up to a certain specified standard, it does not concern the public whether it is produced by a few lamps of large candle-power or by more lamps of less candle-power, or whether tall or shorter posts are used, within certain limits. The lamps must, of course, be so arranged that they are free from glare, and must be placed to the satisfaction of the surveyor, so that they do not interfere with the traffic or with the amenities.

One of the objections, from a contractor's point of view, to the illumination basis of a specification is that it gives him some trouble in calculating and designing the scheme. He considers that, so long as the lamps give the specified candle-power, his responsibilities should end there, and the purchaser must arrange the lighting to suit the needs of the case.

On the other side is the municipal or county engineer or surveyor

Experienced men of this profession have studied the needs of their district, know what the contractors can provide, and understand how to use it when they have got it. But we find that while each man knows his own job, he sometimes has a difficulty in appreciating the needs of a totally different district, and cannot generalise, or even explain the principles on which he successfully designs his street lighting.

It seems better that the lighting authorities should settle what it is they want to buy, and, having specified it, leave details to the competitive skill and wider experience of contractors. What, then, are these authorities "out to buy"? Not lamps, not candle-power, but illumination. So long as there is as high illumination in the main streets as the town can afford, and as much in the side streets as the ratepayers desire, candle-power *per se* does not concern them, and need not greatly trouble their engineers or surveyors.

Another objection to the illumination basis arises from the impression that it is easier to measure candle-power than illumination. The draft specification which will be found in Appendix A recognises several classes of illumination, the lowest having a minimum of 0·01 foot-candle on a horizontal plane 3 ft. 3 in. above the ground. While these classes are of importance so far as quality is concerned, they cover only about 20 per cent. of the street lighting of this country. It is proposed that the balance of 80 per cent. shall be measured by candle-power. The most enthusiastic supporters of the illumination basis agree that there are instrumental difficulties in measuring very low illuminations.

There is also an instrumental difficulty in measuring illumination which falls on a horizontal screen at a large angle of incidence. The draft specification does not provide that the screen shall be horizontal. If desired, it can be inclined to face any lamp, or, in other words, to receive the direct ray at zero angle of incidence.

In the case of that class of street lighting which constitutes by far the largest proportion, and particularly in the extreme case such as the lighting of a country road, the lamps serve mainly as beacons. The illumination on the ground or on any other surface is only useful in the immediate neighbourhood of each lamp. Candle-power is obviously, then, the basis. It is an advantage that the light shall be thrown to a distance, and it is therefore proposed that the candle-power shall be measured in the direction of the thoroughfare, at an angle of 10° below the horizontal. This means that the ray strikes the ground at a distance from the post measured along the street 5·67 times the height of the lamp. As it is convenient to make the measurement at 3 ft. or 4 ft. from the ground, this must be subtracted from the height of the lamp. With a 20-c.p. lamp 12 ft. high, a photometer 4 ft. high will receive the 10° ray if it is placed 45 ft. 4½ in. from the post. The illumination on a photometer screen facing the lamp will be 0·0094 foot-candle. For the more brilliant, though less frequent classes of lighting, where there is no difficulty in measuring the illumination produced, there are several reasons for adopting this as a basis instead of candle-power. The first one has already been mentioned. The public wants light, not lamps. Another reason is that this allows the fullest scope for invention, economical spacing, and minimum cost. A third is that if more that three or four lamps contribute the lighting of any part of a street, the *resulting effect* cannot be obtained by measuring the candle-power of each lamp from that position. The addition of these candle-powers gives no indication of the lighting of the spot in question, unless it is reduced by calculation to the resulting illumination. Nor does the measurement of the illumination on a screen facing each lamp in turn help matters, since it never faces them all at the same time. But if a horizontal screen is set up at this spot it receives illumination from each lamp, and the illuminations are automatically added together, and may be measured simultaneously.

The two advantages of the horizontal plane are that: (1) if the illumination on it is sufficient, that on the other planes must be better; and (2) the illuminations received from all neighbouring lights add themselves together and give one single quantity which may be measured by one single observation. The economy of time and saving of calculation is enormous.

When the lighting of a street is judged, as the specification recommends, by the minimum illumination, the labour is again largely reduced. It is found in practice that it is very easy to find the minimum illumination, and this extends over a considerable area.

An objection to the horizontal plane measurement is that it takes account of reflected light from buildings. Experiment shows that in ordinary West End London streets, with painted stucco, the difference, as measured on the photometer, is extremely small, and is generally beyond the practical limits of error.

Reflected light from the sky is of greater importance. This must be reckoned with in accurate candle-power photometry by narrowing the field of view, and it is one of the reasons why illumination photometry must give place to candle-power measurements when the light is feeble.

For these and other reasons a considerable majority of those who have given attention to this matter agree that the illumination received on a horizontal plane is the best measure of the lighting of a street.

A photometer for use in a test-room may be graduated directly in candle-power, but an instrument to be used in the streets at various distances from the source of light must be graduated in foot-candles. The reading, multiplied by the square of the distance in feet, gives the candle-power.

Take a case from the table in Appendix A: A lamp 12 ft. high, the photometer set up 3 ft. 3 in. from the ground, and 50 ft. from the lamp-post (fig. 1). As we do not want to know the actual distance of the lamp from the photometer, but the square of that distance, we take $(12 - 3{\cdot}25)^2 + 50^2 = 2{,}577$. Let the illumination measured on the photometer screen directly facing the light be 0·029 foot-candle. Then the candle-power of the lamp is $0{\cdot}029 \times 2{,}577 = 75$.

The illumination which would be received on a horizontal screen is less than 0·029 in the same proportion that the height of the lamp is less than the slant distance from the lamp to the screen. The slant distance, the square root of 2,577, is 50·77. The ratio 8·75 : 50·77 is 0·1725, and this, multiplied by 0·029, is 0·005, the

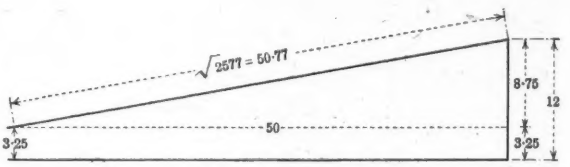


Fig. 1.

illumination required. Or the angle of incidence may be calculated or measured. It is easier to measure it to 1° than to level the photometer to that accuracy. To calculate it, find the tangent. This is the ratio of the horizontal distance to the height; 50/8 75 = 5·71. The angle is about 80°, and the tables give the cosine 0·1725, the ratio required. Another lamp 50 ft. away doubles the illumination, making 0·01, for which the table is calculated.

This is a case in which the illumination on the horizontal plane would be difficult to measure with some photometers if there were only one lamp, on account of the feeble illumination, 0·005, and the large angle of incidence; an error of 1° makes 10 per cent. difference at this angle. But when the illumination received at the midway point from the two lamps is measured, the reading 0·01 should give no difficulty, and a slight inclination of the photometer towards one lamp is balanced by its inclination away from the other. Some calculation is needed to find the candle-power, more is required to deduce the illumination from it, but none whatever is necessary if the illumination is measured directly on a horizontal screen.

Assuming, then, that for the higher classes of street lighting the illumination received on a horizontal plane 3 ft. 3 in. above the ground is to be the basis of the estimation of the lighting, we have to consider how this has to be treated.

In all these classes some attempt is made towards uniform distribution. The mean value suggests itself as the one to be considered, but if this is investigated it will be found to involve a considerable amount of calculation.

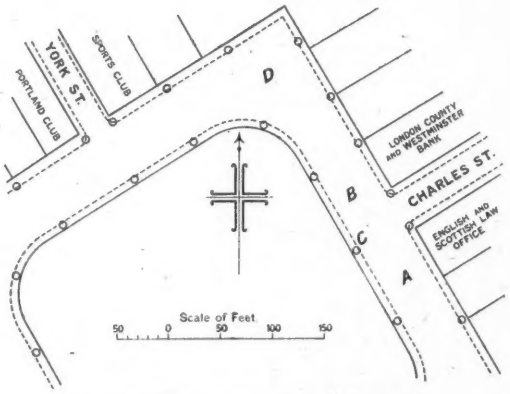


Fig. 2.—Part of St. James's Square.

A little consideration shows that, while the mean illumination of a street may be up to a reasonable standard, it may have alternations of dazzling brilliance and dismal darkness. This proposal may therefore be discarded.

Some have suggested that the average between the best and the worst parts should be taken; but the area of the former always exceeds that of the latter, and the ratios extend in practice over such wide limits that this comparison will not serve.

The most satisfactory test appears to be the simple minimum illumination. Any excess of light may be regarded as a voluntary benefaction from the lighting authority or an unavoidable concession by the contractor. The draft specification provides that the height at which it is proposed to place the centre of light of each type of unit above the street surface is to be given in the schedule to the tender. This gives the lighting authority an opportunity to control excessive light.

The surveyor members were asked to visit some streets for the purpose of judging what kind of classification would be possible. In the first place, they excluded the lighting of thoroughfares of a special character, where the lighting is more than is usually necessary for ordinary traffic. They thought that for any public lighting

purposes streets might well be grouped under three headings :—(*a*) First-rate main lines of thoroughfare ; (*b*) auxiliary roads and relief main roads ; (*c*) side and unimportant streets.

It appeared desirable that this purely qualitative classification should be checked by quantitative measurements, and Mr. K. Edgcumbe, Prof. J. T. Morris, and the author undertook to make a series of tests on the basis suggested by the draft specification, namely, the minimum illumination on a horizontal plane 3 ft. 3 in. from the ground, as well as the maximum illuminations.

About 88 photometric measurements were made, besides measurements of distance and angle, at 31 places. A Trotter photometer was used. No difficulty was found in comparing lamps of different colours.

The work began in St. James's Square at about 7 p.m.

Fig. 2 shows the positions of the first four sets of measurements, A, B, C, and D.

The highest maximum was found in Bayswater Road near Victoria Gate (2·28 foot-candles), and this was 67 times the minimum, giving a larger ratio than in any other street measured on that evening. The ratio of maximum to minimum in Harley Street was 18, being less than in any other of the streets measured. The lighting of the Borough of St. Marylebone is so uniform that no lower illumination could be found in that district.

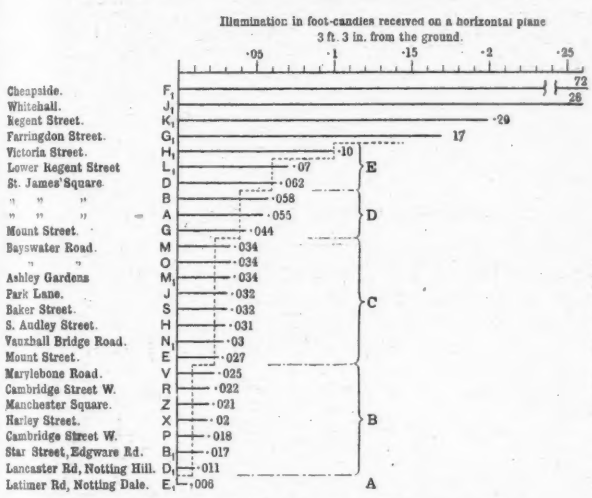

Illumination in foot-candles received on a horizontal plane 3 ft. 3 in. from the ground.
·05
·1
·15
·2
·25
Cheapside. F1 72
Whitehall. J1 26
Regent Street. K1 ·29
Farringdon Street. G1 17
Victoria Street. H1 ·10
Lower Regent Street L1 ·07 E
St. James's Square D ·062
" " B ·058
" " " A ·055 D
Mount Street. G ·044
Bayswater Road. M ·034
" O ·034
Ashley Gardens M1 ·034
Park Lane. J ·032
Baker Street. S ·032 C
S. Audley Street. H ·031
Vauxhall Bridge Road. N1 ·03
Mount Street. E ·027
Marylebone Road. V ·025
Cambridge Street W. R ·022
Manchester Square. Z ·021
Harley Street. X ·02 B
Cambridge Street W. P ·018
Star Street, Edgware Rd. B1 ·017
Lancaster Rd, Notting Hill. D1 ·011
Latimer Rd, Notting Dale. E1 ·006 A

Fig. 3.—Results of Photometric Measurements.

By inadvertence, the class letters are not the same as those suggested in the specification. A represents the lowest class, viz., minimum below 0·01 foot-candle. B is from 0·01 to 0·025. C is from 0·025 to 0·04. D is from 0·04 to 0·06. E is from 0·06 to 0·1.

The results of these photometric tests—which are set out together with others in fig. 3—are rather remarkable when they are compared with the report of the surveyor members. It shows that they so accurately classified the streets by eye that, when the measurements of minima are arranged in order, they fall exactly in the classes. The class (*a*) has an illumination on a horizontal plane 3 ft. 3 in. from the ground, not less than 0·025 foot-candle. The minimum illumination in class (*b*) varies from 0·025 to 0·015, and in class (*c*) it falls below 0·015.

This agreement is noteworthy. It shows that the judgment by eye by experienced men is in accordance with careful photometric tests ; that photometric tests of illumination are not mere scientific experiments, but confirm quantitatively in definite figures the judgment of the eye ; and, lastly, that the surveyor members seemed to have been unconsciously influenced by the minimum illumination in each case, for the maximum illuminations show no sort of agreement. Another result of these tests is to show that the ratio of maximum to minimum illumination is not a matter of importance, and it was agreed by the Committee that this point, which had appeared in the first preliminary draft, should be dropped. If the measurements had been made at the centre of the road they would have been slightly higher, because the minimum places were not always in the middle of the street.

On discussing the proposed classification there appeared, at first, to be a difficulty in dealing with those cases of brilliant street lighting which were net included in the report by the surveyor members. It was decided to invert the order, and to begin with the most extensive, and therefore very important class, in which the minimum is below 0·01 ft.-candle, which will be measured by taking the candle-power of the lamps. This class was not designated. The other classes are as follows :—

A.	Minimum at least	0·01	ft.-candle	
B.	"	"	0·025	"
C.	"	"	0·04	"
D.	"	"	0·06	"
E.	"	"	0·1	"

This leaves some 20 letters available for such higher classes of illumination as the progress of civilisation may call for, classes which electric light and gas engineers will be happy to provide when invited.

A table originally calculated by Mr. Haydn T. Harrison to show the candle-power required to produce a minimum illumination of 0·01 foot-candle on a horizontal plane 3 ft. from the ground, midway between two lamps of a given height and distance apart, is given as a graph in fig. 4. The lamps are supposed to give equal candle-power in all directions. The graph shows the economy of placing the lamps as high as possible, subject to practical considerations. Tall lamps in a narrow street waste much light on the walls of the houses.

When the Committee had reached this stage they were asked to consider a draft specification which, while incorporating some of the principles on which the majority seemed to be agreed, directed that the surveyor should fix the position and height of all lamps, and adjudicate on refracting lenses and reflectors. It was suggested that candle-power should be measured at two angles—20° and 50° with the horizontal. This was fully discussed at several meetings, and attempts were made to reconcile or to amalgamate the two somewhat different drafts.

It was finally agreed to put forward a draft of "Standard Clauses for Inclusion in a Specification of Street Lighting."

These clauses were accepted by the Council of the Institution of Electrical Engineers. The Council of the Institution of Municipal and County Engineers suggested some useful drafting amendments. The Council of the Illuminating Engineering Society accepted the

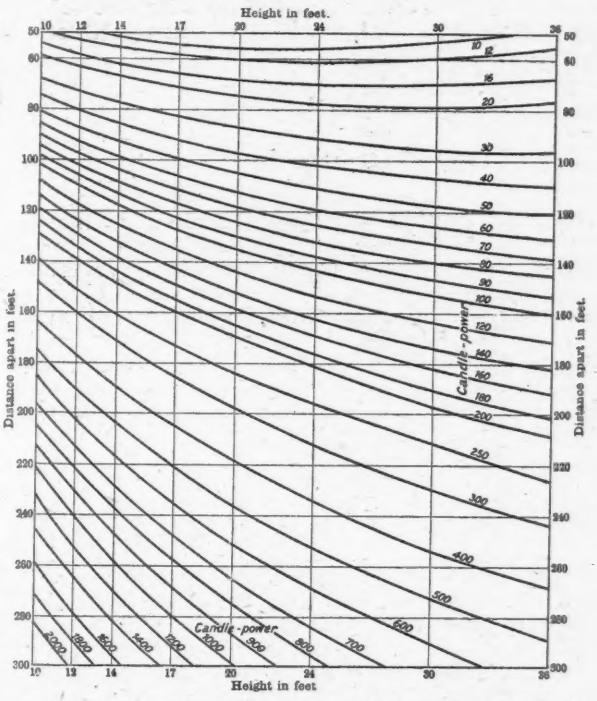


Fig. 4.—Graph of Table Prepared by Mr. Haydn T. Harrison, giving the candle-power necessary to produce a minimum illumination of 0·01 foot-candle on a horizontal plane 3 ft. 3½ in. above the ground, the lamps being at various distances apart.

clauses as a draft and tentative specification. The Institution of Gas Engineers, while fully appreciating the valuable work which had been done, regretted that they could not agree with the fundamental basis of the suggested specification, namely, the stipulation of illumination with a stated foot-candle minimum measured on the horizontal plane.

The Joint Committee, in these circumstances, were reluctant to take any further steps until an attempt had been made to review the problem and to give an opportunity for a full debate upon it.

Meantime the author has been invited to contribute a paper before the Illuminating Engineering Society dealing with some aspects of street lighting. It occurred to the Council that the platform of the Illuminating Engineering Society might be utilised for an open discussion on the tentative specification prepared at a joint meeting of the four bodies interested. This proposal met with the unanimous approval of the Joint Committee. The present paper is the result.

Accident.—A telephone foreman lineman, named T. H. Birch, whilst repairing a wire at the rear of Scaitcliffe Hall, Todmorden, last Saturday week, slipped on some rocks and fell a distance of 25 ft. into a brook. He suffered a fractured collar-bone and breast bone, and a pair of pliers in his pocket penetrated 2 in. into his body. His workmate, Henry Forrest, unable to reach the injured man, climbed the telephone pole, and, by means of his pocket instrument, telephoned to the exchange station at Todmorden for help. On the arrival of the ambulance and doctors they had to lower a stretcher to the water, where the injured man still lay, by means of ropes. In the rescue operations Forrest was disabled by a boulder which became dislodged.

THE ELECTRICAL TRADES BENEVOLENT INSTITUTION.—FESTIVAL DINNER.

On Wednesday last week the festival dinner of the Institution was held at the Trocadero Restaurant; Mr. George Sutton presided, and about 120 supporters of the Institution and guests were present. Unfortunately, a considerable number of gentlemen were prevented from attending, and sent messages of regret, including Lord Vaux, Sir E. Spencer, Sir J. Wolfe-Barry, Dr. Ferranti, Mr. Rutherford, Mr. Hirst, Mr. Duddell, Mr. Kingsbury and Mr. Garcke.

After the loyal toast, the president rose to propose "The Electrical Trades Benevolent Institution," remarking that he was anxious to secure the autographs of those gentlemen who had not already supplied them. The toast, he said, was the real business of the evening; it was a pleasure to meet old friends, but the main purpose of their being there was to do honour to the toast. It was but a young Institution, and the funds were very small; they wanted to make those funds very much larger. They were in their seventh year, and the funds amounted to only £4,000—a sum that was not worthy of the electrical industry in 1913. Mr. Garcke at the annual meeting told them that there were 500 millions sterling of British capital invested in the industry in the United Kingdom, and nearly 500,000 persons were employed. A large proportion of the latter, it was true, were outside the scope of the Institution, but there was a large number left within it. Many of them knew the difficulty of collecting funds for a charitable society, even in a country famous for generations beyond all others as a philanthropic nation; and since the State had added philanthropy to its functions, it was enormously more difficult to raise funds. But the National Health Act and Old Age Pension Act, good or bad as they might be, had not done away with the necessity for the work of that Institution, which was needed just as much as ever. The objects of the Institution, as set forth on its note-paper, were "to grant pensions and dispense temporary relief to deserving and necessitous persons who are or have been engaged in the electrical trade in the United Kingdom as employers, managers, teachers, or on the engineering, designing, drawing, sales or office staff, or in other similar capacities, or to their dependents"; they left out those who were more directly interested in the State Acts. The primary object of the Institution was to grant pensions—but no pension could be granted from a capital of £4,000, though a great deal of good had been done by small grants of money. His experience showed that it was much easier to get money from those who had not a great deal to spare than from those who were well-to-do. The directors of prosperous firms were often afraid lest they should do with other people's money what they ought not to do, and thought they had no right to contribute; he entirely disagreed with that view. Some companies did grant sums of money; their names appeared on the published lists, but the shareholders never did, and never would, object to the board of directors doing what was right in this respect. Again, some large firms had their own provident funds, and said that they looked after their own people—let others look after theirs. But it was only the large firms that could have their own provident funds, and this Institution had been created to look after the employés of the small firms. Small donations were essential to the Institution, but the backbone of such a society must be the list of members. The Committee could measure their liability if they had a big membership list; but who could measure the good the Institution could do if they gave it the funds? The poor derelicts of the industry who had gone to pieces on the rocks—who was going to help them? He would ask his hearers to use all their persuasive powers to enroll members for the Institution. The *Times* had said that the men who controlled the electrical industry had no understanding of the arts of popular persuasion, and looking at the funds one might agree; but he did not believe it, and he wanted them to show that they had it by getting a large accession to the membership. If employers would become annual subscribers of even a small amount, they could recommend their employés to become members, and at the next festival dinner they would meet under vastly more favourable circumstances.

Mr. A. Bruce Anderson, vice-president, supporting the president's appeal, said that hitherto he had been engaged in pleading the cause of men who were able and willing to work, but could find no work to do; but the claims of those who were not able to work could not be denied. He had been asked to bring to their notice a form of bequest, and a form of application for membership, and to draw their attention to the privileges of subscribers. If they paid £1,000, they could nominate a person for a pension of £40. Of the three great virtues, faith, hope and charity, the greatest was charity; they were all in need of it, but that form of charity for which the chairman appealed in such sincere and earnest terms was the easiest to supply, and he hoped there would be a generous response.

At a later stage the president announced, amid applause, that the contributions received in connection with the dinner amounted in all to the sum of £854 6s.—almost exactly double the amount subscribed last year.

Mr. E. Byng, proposing the health of the president, said no one deserved better of them than he; they had only to look at his list to see how hard he had worked all the year. The speaker did not think the support the Institution received from the electrical trades was at all worthy of the industry, which was stingy and improvident. No one knew how soon he might need help from the Institution. If the staff of every municipal station subscribed only £5, the result would be an income of about £3,000 a year. He was sincerely moved by the president's remarks, and would offer a donation of £100 on condition that nine others would do the same within three months. Mr. H. Hirst had promised to give £100, and the president had already given that amount, so only seven more were needed; let them endeavour to find the seven, and the result would be £1,000 to the funds. Mr. Sutton, acknowledging the toast, said that if he had been of some little service to the Institution he had been rewarded; he hoped his service had not ended with that dinner. He was especially pleased that his health had been proposed by the son of his old friend; they ought to take advantage of his excellent offer, and set a good example for next year.

During the evening a capital programme was performed, the artistes including Miss Ada Forrest, Mr. T. E. Gatehouse, Mr. Falkner Lee, and Mr. Archie Naish, with Mr. Charles Bassett at the piano, and the festival was in all respects very satisfactorily celebrated.

The following is a list of donations and subscriptions received or promised before the Dinner. The subscriptions are marked with an asterisk:—

Chairman's List.

The Chairman	£100	0	0	H. A. C.	£1	1	0
Henley's Teleg. Works Co	100	0	0	Hatton, R. J.	1	1	0
Elecl. Contractors' Assn.	50	0	0	Highton & Son, Ltd.	1	1	0
Babcock & Wilcox	20	0	0	Houblon, J. N.	1	1	0
Gill, Arthur B.	10	10	0	Howard, A. H.	1	1	0
Glover, W. T., & Co.	10	0	0	Jacoby, A. M.	1	1	0
Johnson & Phillips	10	10	0	J. G.	1	1	0
Anonymous	5	5	0	J. & N.	1	1	0
Frankenburg, I., & Sons	5	5	0	Kynoch, Ltd.	1	1	0
London Elec. Wire Co.	5	5	0	Le Bas, Edward, & Co.	1	1	0
Marconi's Wireless Teleg. Co.	5	5	0	Leete, E.	1	1	0
Taylor, G. E.	5	5	0	Lord, F. A. B.	1	1	0
Bath, Henry, & Son	3	3	0	Louis Behrens & Sons	1	1	0
Belshaw, T. O.	3	3	0	Martin, C. P.	1	1	0
Enthoven, H. J., & Sons	3	3	0	Meyer, Montague L.	1	1	0
Merton, H. R., Co., Ltd.	3	3	0	Mills, P.	1	1	0
Wilkins, Campbell & Co.	3	3	0	Morris Ashby, Ltd.	1	1	0
Sullivan, H. W.	3	0	0	Nettlefold & Sons	1	1	0
Barclay Bros.	2	2	0	Newby & Sons	1	1	0
Bergtheil & Young, Ltd.	2	2	0	Potter, W. J.	1	1	0
Bullard, King & Co.	2	2	0	Potter Bros.	1	1	0
Campbell, Donald, & Co.	2	2	0	Rashleigh, Phipps & Co.	1	1	0
Catchpole, E., & Sons	2	2	0	Reade & Co.	1	1	0
Crompton & Co.	2	2	0	Reeves, E.	1	1	0
Deacon, Samuel, & Co.	2	2	0	Rickett, Smith & Co.	1	1	0
Fox, George, & Sons	2	2	0	Ritchie, J. W.	1	1	0
Frankenburg, I., & Sons	2	2	0	R. J. & N., Ltd.	1	1	0
Middleton, V. G.	2	2	0	Schwann & Co.	1	1	0
Rennie, J. T., Son, & Co.	2	2	0	Smith, James	1	1	0
Sunderland, Leo	2	2	0	Spencer, Ed., & Co.	1	1	0
Tanner, A. E.	2	2	0	Syder, P.	1	1	0
Till, Ed., & Co.	2	2	0	Taylor, Tunnicliff & Co.	1	1	0
Tyler & Freeman	2	2	0	Tucker, Geo.	1	1	0
Watson, R. & W.	2	2	0	Wansbrough, E. C.	1	1	0
White, Wm. & Co.	2	2	0	Walton, W. H.	1	1	0
Windschuegl, Chas., & Co.	2	2	0	Wayne, Morgan J.	1	1	0
Atkinson, Llewellyn B.	2	0	0	Whaley, S. W., & Co.	1	1	0
Adams Bros.	1	1	0	Baxter, J. M., & Co.	1	0	0
Arnold & Co.	1	1	0	C. E. T.	1	0	0
Ashworth, H.	1	1	0	Hudson, T.	1	0	0
Barlow, H. Dudley	1	1	0	Pond, E. J.	0	15	0
Barnes, J.	1	1	0	Anderson, F.	0	10	6
Bean, Webley & Co.	1	1	0	Bradfield, J. E.	0	10	6
Beyer, Fred.	1	1	0	Crisfield, J. H.	0	10	6
Bishop, W. J.	1	1	0	Everitt, A. W.	0	10	6
Bolton, Thomas, & Sons	1	1	0	Hedgcock, A. J.	0	10	6
Bradfield, W. W.	1	1	0	Hunter, F. C.	0	10	6
Bradshaw, R. A., & Sons	1	1	0	J. H. R.	0	10	6
Brousson, R. P.	1	1	0	L. & W.	0	10	6
Carless, Capel & Leonard	1	1	0	Metal Jointing Co.	0	10	6
C. H. A.	1	1	0	Monarch Typewriter Co.	0	10	6
Church Street Mfg. Co.	1	1	0	Nichols, W. H.	0	10	6
Connell, E.	1	1	0	Oscar Jones & Co.	0	10	6
Cottis, Wm., & Sons, Ltd.	1	1	0	Polyblank, W. J.	0	10	6
Dashwood, E. S.	1	1	0	Roffey, A. F.	0	10	6
Dussek Bitumen Co.	1	1	0	Russell, C. Newton	0	16	6
E. A. P.	1	1	0	W. B. & Co.	0	10	6
Easton, C. J.	1	1	0	Wilson, L. E.	0	10	6
Easton, J. J.	1	1	0	Bertram, C.	0	10	0
Electrical Co.	1	1	0	Glasgow Steel Roofing Co.	0	10	0
Emslie, J. F., & Co.	1	1	0	Arkell, H.	0	5	0
Espir, Fernand	1	1	0	Bridges, T.	0	5	0
E. W. & S.	1	1	0	Thornby, E.	0	5	0
Fuller, J. Leslie	1	1	0	Mann, E. C.	0	5	0
Gaskell & Grocott	1	1	0	Smith, E. R.	0	5	0
Graves, T.	1	1	0	Anonymous	0	2	6
				Bill, J. C.	0	2	6

Other Contributions.

American Hard Rubber Co.	£0	10	6	Cantie Switch Co., Ltd.	*£1	1	0
Adnil Electrical Co.	*2	2	0	Chaplin, H., & Co.	*1	1	0
Automatic Standard Screw Co.	0	10	6	Clay, C. B.	*1	1	0
Baker, B. B.	0	2	6	Coates, C.	*0	10	0
Barkham, C.	*0	10	6	Concordia Elec. Wire Co.	*3	3	0
Barr, Moering, & Co.	*1	1	0	Conradty, C.	*3	0	0
Barwell, James, & Sons	0	10	6	Cook, A. H.	*0	5	0
Bates, W.	*0	2	6	Cook, W. W.	1	1	0
Baugham, A. H.	*0	10	6	Cookson & Co., Ltd.	1	1	0
Beaver, A. G.	*1	1	0	Cooper, R. G.	*0	10	0
Becker, R.	0	10	6	Cramb, A. C.	*0	10	6
Becker, R., & Co.	0	10	6	Cranmer & Cheshire	1	1	0
Berridge, Geo., & Co.	*2	2	0	Cryselco, Ltd.	1	1	0
Best & Lloyd, Ltd.	1	1	0	Charles & Dible	1	1	0
Birmingham Lighting Co.	1	1	0	Clark, W.	1	1	0
Bishop, S. & C., & Co.	0	5	0	Clark, E. J.	1	1	0
Blackburn, Starling, & Co.	*2	2	0	Davidson & Co., Ltd.	*1	1	0
Bonnella & Son, Ltd.	1	1	0	Davies, Kent & Stewart, Ltd.	0	10	6
Boulton, G., & Son	0	10	6	Devonshire, J.	*2	2	0
Bowden, G. Harland	*10	10	0	Digby, T. J.	*5	5	0
Brimsdown Lamp Works	*2	2	0	Digby, T. J.	0	10	6
British Electric Calibrated Fuse Co.	1	1	0	D. P. Battery Co., Ltd.	0	10	6
Brit. Thomson-Houston Co.	10	0	0	Eck, Justus	3	3	0
Brundle, F. H.	0	10	6	Electrical Review	10	10	0
Burney, Guy	*2	2	0	*Electricity*, Proprietors of	*1	1	0
Burt Bros.	1	1	0	Ellison, Geo.	1	1	0
Burton, Col. H.	1	1	0	English Bros., Ltd.	0	10	6
Baldwin J. H.	0	10	6	Esender, C. M.	*0	10	0
British Oxygen Co., Ltd.	1	1	0	Esson, W. B.	*2	2	0
Cannon, A. V.	0	1	0	Esson, W. B.	2	2	0
				Farmer, R. H.	*0	10	0
				Farmiloe, T. & W., Ltd.	*2	2	0

Fell, A. L. C.	£0	10	6
Forster, J., & Co.	1	1	0
Fox, H. C. J.	*0	10	0
Galsworthy, Ltd.	*1	0	0
Garbe, Lahmeyer & Co.	*2	0	0
Gareke, E.	*10	0	0
Gilbertson, H.	0	1	0
Gillespie & Beales	1	1	0
Glaholm & Robson	0	5	0
Gorham, J. M.	*1	1	0
Gray & Marten, Ltd.	0	10	6
Groves, J. & B.	0	10	0
Hammond, Robt., & Sons	1	1	0
Hardy & Padmore	*0	10	6
Harrison, Haydn	0	10	6
Hart Accumulator Co.	*10	10	0
Hartmann & Braun	*2	0	0
Hellbut, Symons & Co.	5	0	0
Hillier, F. R.	0	2	6
Hill-Jones, T.	1	1	0
Hewetson, H., & Co.	0	10	6
Hobb, W. E.	*0	10	0
Hobb, W. E.	0	10	0
Holophane, Ltd.	*2	2	0
Holmes, F. J.	*1	1	0
Home & Rowland	*1	1	0
Hooper, A. A.	0	1	0
Hornsby, Richard, & Sons, Ltd.	*1	1	0
Howard, A. J.	*0	10	0
Hudson, Edmunds & Co., Ltd.	0	7	6
Hunt & Co., Ltd.	*1	1	0
Hurst, A., & Co.	*2	2	0
Hay, G.	1	1	0
Hirst, H.	10	10	0
Jaeger Bros.	*1	1	0
Jeffs, F. J.	0	10	6
Judd, W.	*1	1	0
Kidd, G. W.	0	10	6
Kahn, Harry	2	2	0
Kieson & Co.	1	1	0
Koettgen, C.	*5	5	0
Kolle, H. W.	*2	2	0
Korting & Mathieson	*5	0	0
Kingsbury, J. E.	2	2	0
Lackie, W. W.	1	1	0
Lampitt, C. B.	1	1	0
Lax, Hermann	1	5	0
Leach, F. G.	*1	1	0
Leaf, H. M.	1	1	0
Leftwich, F. A.	0	10	0
Lench, T. W., Ltd.	1	1	0
Linolite Co.	1	1	0
Llewellyn, D.	*0	10	6
Locke, Lancaster, & Co., Ltd.	*1	1	0
London Zinc Mills, Ltd.	0	10	6
Lund, Humphries, & Co.	*0	10	0
London Electric Firm	1	1	0
Lind & Co., Ltd.	0	10	6
Madgen, W. L.	*2	2	0
Maurice, G.	0	1	0
Mehne, J. G.	1	0	0
Meyer, Arthur, & Co., Ltd.	2	2	0
Miles Bradley C.	1	1	0
Mill, Fred., & Co., Ltd.	0	10	6
Money, H. W.	0	1	0
Moody, G. T.	2	2	0
Moore, F. C.	*0	10	0
Morgan Crucible Co., Ltd.	1	1	0
Morris, H. N., & Co., Ltd.	*1	1	0
Morrison, Alex.	*0	10	0
Moul, H. E.	*1	1	0
Morton, E. R.	*0	10	0
Messrs, Ltd.	0	5	0
McWhirter, Wm., & Co.	1	1	0
Myers, Leo M.	1	1	0
Nance, Harry	*0	10	0
Nixen & Sons, Ltd.	0	5	0
Newman, F.	0	10	6
Newmen, F.	*£0	10	0
Northern Electric Wire Co.	1	1	0
Prangnell, N. W.	0	10	0
Pollard, Wm., & Co., Ltd.	1	1	0
Pettifor, H.	0	1	0
Plumtree, J. S.	*0	10	6
Potteries Electric Traction Co., Ltd.	0	7	6
Prior, E.	*1	1	0
Poole, R.	*0	10	0
Pilkington Bros., Ltd.	*0	10	6
Pirelli, Ltd.	2	2	0
Preece, Cardew & Snell	*2	2	0
Petersen, M.	2	2	0
Paul Rauschert Porcelain Works, Ltd.	2	10	0
Quance, F. G.	*0	10	0
Quitmann, Carl	1	1	0
Redmayne, L.	*0	10	6
Richards, W. L.	*0	10	0
Riseley, D. S.	*0	10	0
Rogers, S.	0	10	6
Richard Johnson, Clapham and Morris, Ltd.	1	1	0
Swinburne, J.	1	1	0
Spencer, Sir Ernest	2	2	0
Starkey, W. J. S. Barber	*0	10	6
Stagg & Robson	*1	1	0
Sanders, Wm., & Co.	*1	1	0
Schumann, Miss A. C., and assistants	0	10	0
Silcock, Chas.	1	1	0
Sloan Electrical Co., Ltd.	*2	2	0
Sparrow, N.	*0	10	0
Stolzenburg Patent File Co.	*1	1	0
Stranack, H. S.	0	1	0
Straus & Co., Ltd.	*2	5	0
Swinton, A. A. Campbell	*10	10	0
Snell, J. F. C.	*1	1	0
Sterling Telephone Co.	*3	3	0
Soutter, Wm., & Sons, Ltd.	1	1	0
Sun Electrical Co.	*3	3	0
Spies Bros. & Co.	*1	1	0
Spicer Bros., Ltd.	1	1	0
Standard Cable Mfg. Co.	3	3	0
Schall, W. E.	1	1	0
Schuster, W. S.	1	1	0
Symington, Wm.	2	2	0
Sugden & Hextall	1	1	0
Spratt, L. W.	1	1	0
Thacker, F. C.	*0	10	6
Thomas, N. F.	0	1	0
Thomas, Miss W.	*0	10	0
Thompson, W. P., & Co.	*1	1	0
Trotter, A. P.	*2	2	0
Tucker, J. H., & Co.	1	1	0
Turner, L. V.	0	1	0
Turner & Burger	0	10	6
Taylor, Tunnicliff & Co., Ltd.	*2	2	0
Unwin Bros.	*1	1	0
Vacuum Oil Co.	1	1	0
Venner & Co.	*1	1	0
Voigt & Haeffner, Ltd.	2	0	0
Von Chauvin, G.	2	2	0
Watlington & Co., Ltd.	0	10	6
Wardroper, A. E.	0	2	6
Wallach Bros.	*1	1	0
Wallis-Jones, Regd. J.	*1	1	0
Worrell & Baynes	0	10	6
Waddie & Co., Ltd.	*0	10	6
Walter Scott, Ltd.	2	2	0
Whitehouse & Co., Ltd	*0	10	6
Wilkinson, H. D.	*2	2	0
W. J. B.	0	5	0
Ward & Goldstone	*3	0	0
Wilkins & Wright	1	1	0
Weeks, H. C.	*1	1	0
Wallace Bros. & Co.	2	2	0
Winter, F.	5	0	0
Yendall, E. R.	0	0	6

The following contributions have also been received in the course of this year :—

Moulton, Lord	*£1	1	0
Ferranti, Ltd.	*5	5	0
Berry, H. H.	*1	1	0
Electromotors, Ltd.	*2	2	0
Ruberoid & Co.	*1	0	0
Bishop, O. H.	*1	0	0
Nash, E. A.	*1	1	0
Anderson, A. Bruce	*£2	2	0
Samuelson, G. B.	*2	2	0
Bastian, C. O.	*2	2	0
Ireland, A. J.	*1	1	0
Lemmon, Miss M.	*0	10	0
Sargent, Miss B. M.	0	10	6
Hawes, F. B. O.	*1	1	0

Further contributions were received during the dinner, of which a list will be given later.

BRITISH TRADE IN THE RUSSIAN FAR EAST.

While we are so busily engaged upon schemes for foreign trade expansion, we need to be reminded occasionally that there are vast tracts of territory which, if we have not actually overlooked them, we have to all appearances treated as not being worth our while—at any rate in their present undeveloped state. We have had put before us particulars of a scheme under which it is hoped that British firms will shortly devote themselves aggressively, and with considerable profit, to one of these vast fields. We refer to Siberia, where the opportunities for British engineering and other manufacturers seem to be very great. We hope to give fuller particulars in our next issue, but in the meantime we may quote here from one of the latest Consular reports issued regarding that part of the world.

The Electrical Review has previously drawn attention to the fact that British firms are rather neglectful of the opportunities for trade extension which exist in the Russian Far East. The position recently has remained pretty much what it always was, with, perhaps, a slight tendency towards improvement. The number of travellers representing British firms has certainly shown an increase, and instead of following the previous practice of dashing through Vladivostok on the way to or from some other country, and spending a few hours, or at the most a couple of days in the district, those who came had generally sufficient time at their disposal to get a reasonable grasp of the local commercial conditions and the prospects of trade. In this connection the British Consul at Vladivostok in a recent report points out that such travellers as were in a position to visit Eastern Siberian centres appeared to carry away the impression that there does really exist there a market for British goods, and that, if any effort is ever to be made to take advantage of it, the present is the time to make it. Among other orders placed at home recently, may be mentioned brick-making machinery, crucible steel, lathes, and workshop equipment, motor-boat engines, refrigerating machinery, &c. British portable engines continue to hold their own, and the import of corrugated iron and flat sheets, always important, is increasing in volume.

The Amur Railway, which is making rapid progress, and should be completed except for the bridge over the Amur at Khabarovsk in 1915, is opening up a large area hitherto untouched; the Russian Government is taking in hand quite a variety of important undertakings, including the proper equipment of Vladivostok Harbour, with extensive electrical installations, the dredging of the approaches to the Amur, and very large building operations for the naval and military departments in various parts of the country; the colonisation authorities are improving the means of communication, and the settlement on the land of peasants from European Russia is progressing under more satisfactory conditions than has been the case in the past. What is more important still, Russian labour is being introduced in place of Chinese on all works depending upon Government, and is being encouraged on private enterprises. On all sides are visible signs of the fixed policy of Russia to develop the Amur Province and populate it with her own people. In addition the exploitation of the natural resources of the country encouraged by a liberal and sympathetic attitude on the part of the administration, is finding the capital which is essential to it.

The purchasing power of the community is, therefore, increasing; it will be interesting to see whether British manufacturers will maintain their aloof and distrustful attitude towards it or whether they will make some serious effort to establish themselves in a market which they have been content hitherto to leave untouched.

It should be at once said that the despatch of an occasional traveller will not effect this object, nor will the distribution of the most alluring catalogues be of much avail. British firms must be actively and efficiently represented on the spot, and until this is done no real improvement in the position can be hoped for. They must bear in mind that German trade has gained predominance here by starting from small beginnings when the Russian occupation was in its infancy, and that it has grown up with the country; that the large German stores having Vladivostok as their centre of operations were founded 40 or 50 years ago, are thoroughly familiar with the wants of the inhabitants, and have accustomed them to the use of German goods; that they have a perfect acquaintance with the language, have opened branches in the various centres as their growing importance seemed to justify it, and have trained and capable technical staffs. Being on the spot and organised so as to gauge the financial stability of their clients, they can—what is all-important here—give credit where circumstances justify it and have a hold over purchasers which distant firms can never obtain.

The foregoing will hardly sound encouraging to firms desirous of working up business in Vladivostok, but no good object can be achieved by minimising the disadvantages under which they must labour if desirous of making an effort to repair the indifference of the past. The lines on which such an effort should be made, in the opinion of the Consul, have been sketched in the course of correspondence between the Consulate and the Commercial Intelligence Branch of the Board of Trade, where further information might be obtained.

An important point to be remembered, particularly in the case of machinery, is that packing of goods for delivery to Vladivostok should be very carefully executed. Cargo for Vladivostok, unless sent *viâ* Shanghai by fast steamers, is generally three months or more on the way, and has, more particularly in the winter months, to go through extremes of temperatures. Bright parts of machinery must, therefore, be protected and thoroughly coated with anti-rust composition. Hay and straw must not be used, and parts must not be left loose in cases, but must be carefully secured. Great care is recommended in despatching, so as to ensure that no portions or fittings of machinery be omitted, since it is generally impossible to replace anything here, or, if supplies can be obtained, they are very dear. Another point worthy of attention while on the subject of machinery is the importance of sending in good time full specifications and working plans. When supplying boilers, certificates of factory tests must always be sent, and it must be remembered that the requirements of Russian law must be studied and complied with.

Building Trades Exhibition.—In addition to the firms mentioned in our last issue as showing at this exhibition, which closes to-morrow at Olympia, Messrs. C. Jennings & Co., of Bristol, have on Stand No. 164, Row H, an exhibit of woodwork, fretwork screens and arches, doors in various designs, stairs, windows, "Teekard" block flooring, and electric light casing.

Strikes.—On Monday last week the labourers and semi-skilled workers at the Preston Works of Messrs. Dick, Kerr & Co., Ltd., came out on strike in respect of a dispute regarding wage advances. New terms were offered by the firm on the following day and accepted, work being resumed on Wednesday.

It is announced that a strike at the works of the Hoffman Manufacturing Co., at Chelmsford, which had affected 1,800 men and girls, was settled on Tuesday night. Men over 21 years of age, with six months' service, are to be paid a minimum of 5d. per hour.

FOREIGN AND COLONIAL TARIFFS ON ELECTRICAL GOODS.

AMENDMENTS.

GERMANY.—The Board of Trade desires to call the attention of manufacturers and shippers in this country to the fact that in accordance with the German regulations for the importation of merchandise by rail, goods so entering Germany (even goods in transit) are now required to be accompanied—apart from the ordinary consignment note—by a special declaration, in duplicate, on a form prescribed, which is to be filled up, both in French and German, by the sender of the goods, and in which (among other particulars) the nature of the goods has to be entered with the terms of the descriptions used for such goods in the German Customs Tariff. The net weight of the goods has also to be given in respect of parcels containing goods subject to different rates of duty. The fact that this special declaration is being sent must be noted by the consignor on the consignment note. A copy of the form of declaration prescribed may be seen by persons interested at the offices of the Commercial Intelligence Branch of the Board of Trade, at 73, Basinghall Street, E.C.

HOLLAND.—The Dutch Customs Authorities have decided that zinc bars for battery cells only cut to measure, but not prepared for use in any other manner, are to be admitted free of duty. Lubricating apparatus for the automatic greasing of machines is also to be admitted free of duty.

ST. LUCIA.—In accordance with the Canada—West Indies agreement the Government of St. Lucia have decided to put into operation a preferential tariff in favour of British goods, the preference to be given to amount to one-fifth of the duty leviable on foreign goods. The date of coming into force will be fixed subsequently.

ITALY.—The Italian Customs Authorities have decided that dry batteries for small electric hand lamps are to be dutiable at the rate of 30 lire per 100 kg. (25 lire = £1, kilog. =2·204 lb.).

VENEZUELA.—The Venezuelan Commercial Code provides that the contents of packages of goods shipped to Venezuela must be declared on the Consular Invoice by giving the name of the article, the material of which it is made, and the quality or condition which distinguishes it from any other article of the same name covered by a different class of the tariff. The Code also provides that if these particulars are not set out in the Consular Invoice the importer will be fined a sum of from £5 to £40 at the discretion of the Director of the Customs House where the goods were imported. Duty is also levied on such cases under the highest class of the tariff under which articles of the kind can be assessed for duty.

In a dispatch from H.M. Minister at Caracas, which has recently been received at the Board of Trade, it is pointed out that in cases in which a fine is imposed by the Custom authorities, there is no remedy unless the consignees at once petition the Venezuelan Minister of Finance, on stamped paper, urging a remission or reduction of the fine on the ground of there having been no intent to defraud the Customs. When such a petition is lodged, a nominal fine equivalent to £1 may be substituted for the fine originally imposed.

NEW PATENTS APPLIED FOR, 1913.

(NOT YET PUBLISHED.)

Compiled expressly for this journal by MESSRS. W. P. THOMPSON & Co., Electrical Patent Agents, 285, High Holborn, London, W.C., and at Liverpool and Bradford, to whom all inquiries should be addressed.

8,115. "Luminous electric devices." L. H. WALTER. April 7th.

8,123. "Incandescent electric lamps." E. P. BECKWITH. April 7th. (Complete.)

8,124. "Incandescent electric lamps." E. P. BECKWITH. April 7th. (Complete.)

8,128. "Dynamos." C. T. MASON. (Convention date, April 23rd, 1912, United States.) April 7th. (Complete.)

8,130. "Process for the regeneration of oil employed as transformer oil and the like for use for electrical purposes." SIEMENS SCHUCKERTWERKE G.M.B.H. Convention date, April 6th, 1912, Germany.) April 7th. (Complete.)

8,173. "Mode and apparatus for sending and reproducing telegraphic signs." H. KAHLER and P. KAHLER. (Convention date, April 6th, 1912, Germany.) April 7th. (Complete.)

8,188. "Telephone exchange systems." D. H. KENNEDY and J. W. TURNER. April 7th.

8,198. "Electric glow lamp." C. B. HERRMANN. (Convention date, December 16th, 1912, Germany.) April 7th. (Complete.)

8,233. "Electric lamps." F. WESTWOOD. April 8th.

8,240. "Apparatus for photographically recording electrical measurements and for like purposes." SIEMENS & HALSKE AKT. GES. (Convention date, April 10th, 1912, Germany.) April 8th. (Complete.)

8,244. "Electrical appliance for use in hairdressing." J. D. MARINIS. April 8th.

8,267. "Electric collectors for tramway and like vehicles." A. HELFENSTEIN. (Convention date, April 18th, 1912, Austria.) April 8th. (Complete.)

8,273. "Electrical indicating apparatus for use on steam trains." W. WHITE and G. H. GARDENER. April 8th.

8,299. "Construction of electrical alarm attachments to clocks." J. BOWIE and A. M. CARNEGIE. April 9th.

8,300. "Method of construction of medical shocking coils." J. BOWIE and A. M. CARNEGIE. April 9th.

8,301. "Electric arc lamps." ENGINEERING AND ARC LAMPS, LTD., and A. T. DOWDELL. (Additions to 16,678/11.) April 9th.

8,303. "Means for and method of applying automatic instantaneous switches to the protection of electric generators." A. M. TAYLOR. (Addition to 7,141 of 1910.) April 9th.

8,338. "Electric water-heaters and the like." E. W. LANCASTER. April 9th.

8,352. Process of electrolysis and apparatus therefor." K. S. GUTTERMAN. April 9th. (Complete.)

8,371. "Ignition device for bombs and mines." F. EICHBAUER. April 9th.

8,395. "Electric heaters for liquids." C. O. HASKELL. April 9th. (Complete.)

8,409. "Electric switches." VOIGT & HAEFFNER AKT. GES. (Convention date, July 8th, 1912, Germany.) April 9th. (Complete.)

8,412. "Telephone call apparatus." REBESI, LTD., and F. HOLDEN. April 9th.

8,416. "Electric arc lamps." BRITISH THOMSON-HOUSTON CO., LTD. (General Electric Co., United States.) April 9th.

8,417. "Manufacture of a material suitable for electrical insulation and other purposes." BRITISH THOMSON-HOUSTON CO., LTD. (General Electric Co., United States.) April 9th.

8,424. "Electric lighting vacuum lamp." L. G. BRASIER. April 10th.

8,445. "Means for connecting lampholders to bracket or pendant tubes, or the like wire conduits." G. ST. J. DAY. April 10th.

8,464. "Electrically-driven clocks." P. A. BENTLEY. April 10th.

8,467. "Balance weight suspension with double conductor-supporting cord for electric lighting." A. SCHUCHARDT. April 10th. (Complete.)

8,469. "Process for protecting storage batteries and cells against shocks and knocks, and for preventing the disaggregating of the active substance of the plates." F. SABLON. (Convention date, May 14th, 1912, France.) April 10th. (Complete.)

8,475. "Method of and apparatus for generating and storing electricity." I. v. SKYRZYPLEWSKI. April 10th. (Complete.)

8,485. "Magnetic separators." H. J. H. NATHORST. (Convention date, April 18th, 1912, Sweden.) April 10th. (Complete.)

8,539. "Electrical contacts or connections." J. DUGDILL. April 11th.

8,547. "System of and electric control for track switches of tramways and the like." R. CUMMING. April 11th.

8,561. "Method of utilising the blow of a door knocker or like implement to cause the ringing of an electric bell attached thereto." G. W. BLACK. April 11th.

8,562. "Electric telegraphy." R. APPLEYARD and H. W. MALCOLM. April 11th.

8,568. "Incandescent electric lamp." C. GUISTI. April 11th.

8,584. "Ignition and priming devices for internal-combustion engines and the like." C. G. NOBBS, JUN., and L. DODSON. April 11th. (Complete.)

8,590. "Reflectors for electric incandescent lamps." F. W. EUTER. April 11th.

8,597. "Arc lamps." N. A. HALBERTSMA. (Convention date, April 19th, 1912, Germany.) April 11th. (Complete.)

8,601. "Electricity motor meters of the mercury type." COMPAGNIE POUR LA FABRIKATION DES COMPTEURS ET MATERIEL D'USINES A GAZ. April 11th. (Complete.)

8,602. "Means for use in directly measuring small variation or differences in electrical resistances." HARTMANN & BRAUN AKT. GES. (Convention date, May 8th, 1912, Germany.) April 11th. (Complete.)

8,615. "Prepayment automatic telephones." L. BREGUET and FRERES BREGUET ET CIE. April 12th. (Complete.)

8,624. "Automatic systems of train control by means of separately actuated contactors." SIEMENS BROS. DYNAMO WORKS, LTD., and A. M. DUKE. April 12th.

8,665. "Electric switches." L. RASCH. April 12th.

8,675. "High-potential electrical insulators." BRITISH THOMSON-HOUSTON CO., LTD. (General Electric Co., United States.) April 12th.

PUBLISHED SPECIFICATIONS.

Copies of any of the Specifications in the following list may be obtained of MESSRS. W. P. THOMPSON & Co., 285, High Holborn, W.C., and at Liverpool and Bradford; price, post free, 9d. (in stamps).

1911.

ELECTRICAL DISTRIBUTION SYSTEMS. British Thomson-Houston Co. and E. B. Wedmore. 28,868. December 21st. (Addition to No. 11,979 of 1908.)

SYSTEMS FOR STARTING INTERNAL-COMBUSTION ENGINES AND THE LIKE. C. F. Kettering. 28,903. December 22nd. (April 17th, 1911.)

1912.

CONTROL OF ELECTRIC MOTORS FOR ELECTRICALLY-OPERATED DRIVING SYSTEMS. Crompton & Co., J. C. Macfarlane and H. Burge. 4,995. February 28th. (May 13th, 1912.)

METHOD OF, AND APPARATUS FOR, UTILISING TRANSFORMED AND PRIMARY CURRENTS. W. Dubilier. 6,909. March 20th.

RELAYS FOR ELECTRIC CONTROL SYSTEMS. British Thomson-Houston Co. (General Electric Co.) 7,014. March 21st.

TELEPHONE SYSTEMS. E. A. Mellinger. 7,100. March 22nd.

ELECTRICAL APPARATUS FOR PROTECTING THE HULLS OF SHIPS AND OTHER SUBMERGED STRUCTURES FROM BARNACLES AND OTHER FORMS OF AQUATIC LIFE. J. E. James and W. T. Smith. 7,317. March 26th.

ELECTRICALLY-OPERATED AUTOMATIC PIANO AND LIKE PLAYERS. J. T. Sibley. 7,370. March 26th.

ELECTRIC AND AUTOMATIC CONTROL OF ENGINES, DYNAMOS AND BATTERIES. L. Sunderland and G. C. Pillinger. 7,375. March 26th. (Addition to No. 29,944 of 1909.)

TELEPHONE APPARATUS. E. Grissinger. 7,489. March 27th.

BRUSH HOLDERS FOR DYNAMO-ELECTRIC MACHINERY. Akt. Ges. Brown, Boveri et Cie. 7,577. March 28th. (May 8th, 1911.)

APPARATUS FOR ELECTRICALLY RECORDING THE AMOUNT OF COAL SUPPLIED TO STEAM GENERATORS. W. Whitie and A. E. Langley. 7,885. April 1st.

ELECTRIC MOTOR CONTROL SYSTEMS. British Thomson-Houston Co. (General Electric Co.) 8,611. April 11th.

WELDING. R. S. Kennedy and British Arc Welding Co. 8,987. April 16th.

CORRUGATED SECONDARY BATTERY BOX. E. J. Clark. 10,766. May 7th.

TELEPHONES. R. Lagus. 11,578. May 14th.

TELEGRAPH APPARATUS. E. Pope. 11,605. May 15th.

SECURING ELECTRICAL CONTACT WITH, AND CONTINUITY OF, THE WIRE ARMOURING ON ELECTRIC CABLES WHERE THE CABLES ARE JOINED TOGETHER, OR WHERE THEY ARE CONNECTED TO APPARATUS. A. Hepburn. 13,171. June 4th.

ELECTRODES FOR ARC LAMPS. British Thomson-Houston Co. (General Electric Co.) 13,975. June 6th.

ELECTRICALLY-DRIVEN TILLING MACHINES. W. Wortmann. 15,638. July 4th.

ELECTRICAL SWITCHES. A. H. Kling and B. D. Horton. 16,229. July 11th. (July 11th, 1911.)